

4201

THE
NATURAL HISTORY
OF
NORWAY:

CONTAINING,

A particular and accurate Account of the Temperature of the Air, the different Soils, Waters, Vegetables, Metals, Minerals, Stones, Beasts, Birds, and Fishes; together with the Dispositions, Customs, and Manner of Living of the Inhabitants: Interpersed with Physiological Notes from eminent Writers, and Transactions of Academies.

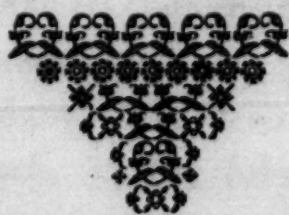
In TWO PARTS.

Translated from the DANISH ORIGINAL of the

Right Rev^d. ERICH PONTOPPIDAN,
Bishop of BERGEN in NORWAY, and Member of the Royal Academy
of Sciences at COPENHAGEN.

K

Illustrated with COPPER PLATES, and a General Map of NORWAY.



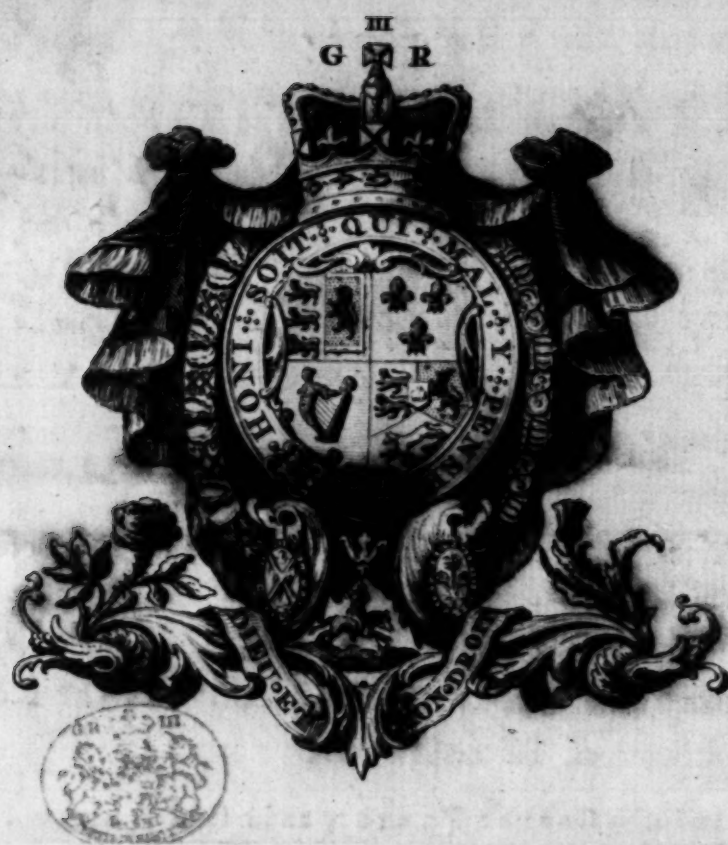
L O N D O N:

Printed for A. LINDE, Bookseller to Her ROYAL HIGHNESS the Princess Dowager
of WALES, in Catherine-Street in the Strand.

MDCCCLV.

NATURAL HISTORY

IN O R W A Y:



The AUTHOR'S PREFACE.

THE chief design of this preface is, to lay before the reader my motives for attempting a Natural History of Norway, together with the opportunities and encouragements which have concurred towards the accomplishment of my design; as such information may, in some respects, be necessary in the perusal of the work.

My principal motive was, to promote the glory of the Creator, by a contemplation of his works. In the instructive book of nature are many leaves, which, hitherto, no mortal has thoroughly perused; though the present times are blest with the happy advantage of all the important discoveries made in natural philosophy, since the commencement of this century, which are superior in number and merit to those of many preceding ages. These have been chiefly promoted by the learned Societies now flourishing in almost every country in Europe, who have liberally encouraged, directed, and excited enquiries into nature, and by the periodical publications of observations, objections, and experiments, have communicated to the world such important truths, as resulted from them.

It is not my present purpose to enquire, how these discoveries have been applied to various ends by persons of different opinions; I shall only observe, that devout men have taken occasion from them to express, in the fulness of their hearts, their faith and love to the great Creator, by applying their natural knowledge, to the support and illustration of this greatest of all truths, "There must be a God; and he must be almighty, omniscient, and infinite in goodness; and though he dwells

dwells in a light inaccessible to any mortal eye, yet our faculties see and distinguish him clearly in his works". In this respect I have the most profound veneration for a Boyle, a Nieuventyt, a Fenelon, a Scheuchzer, a Derham, and the like great and excellent personages; who having been no less conspicuous in the sanctity of their lives, than in their mental abilities, will doubtless find a place among those, or in preference to many of those, to whom the prophet Daniel promises a more exalted degree of glory.

It is true, that the rational part of the heathen world were not unacquainted with the first principles of natural religion, and consequently these are of themselves insufficient for the immediate and perfect conversion of sinners, or the attainment of any degree of that salvation reserved for the members of Christ's mystical body, who live in a more shining-light, and have more abundant offers of grace. But it is equally true, as the Apostle affirms, *he that cometh to God, must first believe that he is, and that he is a rewarder of those who diligently seek him.* A general belief in God, as the creator and preserver, as the rewarder and avenger, must be presupposed, before any faith in the Son of God, the Redeemer, can take place; consequently the first is the basis of the other articles, and though a minister of the Gospel is not to be lightly carried away by the stream, or ought not to follow the crowd of mere philosophic moralists, who pursue vain glory in science, falsely so called, and in contradiction to the mind and example of St. Paul, *are almost ashamed of the gospel of Christ, which alone is and will continue to be the power of God unto salvation*; yet it becomes them as little to deviate on the other hand, into a disregard and contempt of natural truths, and of the occasion which they may draw from them, of promoting the glory of God, among many whose taste and capacity reach no further than sensible objects: and not having been found faithful, even in these lesser matters, are not therefore intrusted with greater. *If, as our Saviour says, we believe not what is said to*

THE AUTHOR'S PREFACE.

v

us of earthly things, how shall we believe when he speaks to us of heavenly things?

I am therefore inclined to think, that neither I nor my brethren transgress the bounds of our ministerial office, by investigating and exhibiting natural truths concerning the works of God, which, like his word, are Jehova's. I am rather of opinion, that a supercilious neglect of such truths, in this critical age, is one of the causes of that contempt, with which the Freethinkers, as they arrogantly stile themselves, look on the ministerial function.

If physical knowlege be not, like godliness, *profitable to all things*, yet it is so to many, and in a certain degree to most things. A civilian, in order to a just solution of a point in law, must previously have a competent intelligence of the fact; * and this is not always to be had from a formal deposition, which is frequently contradicted by others of equal authority; but in many cases, he may be considerably assisted by a perfect insight into the connexions of nature, which will teach him to reject impossibilities, which others would obtrude upon him for certainties, and not to attribute to any cause, however plausibly alledged, what may much more reasonably be supposed the effect of some other cause, though unknown.

The utility, I should say the absolute necessity of this science to medicine, needs no tedious proof, the alliance between natural philosophy and medicine being universally known, and the whole *materia medica* being properly *res physica*. This is sufficiently confirmed by our eminent physicians, Wormius, Bartholin, and Borrichius, who were also consummate naturalists. But my more immediate aim, is to represent the advantages of natural knowlege to those who apply themselves to theological studies, with a view of directing others in the way to salvation. The first knowlege requisite in them, is the knowlege of human nature; for grace and nature are the two great objects, which it is incumbent

* See an ingenious piece in the Hamburg magazine, under the title of Arguments on the usefulness of natural philosophy in the study of the law, Vol. iv. p. 27.

upon them to distinguish on all occasions, when they undertake a cure of souls. In the next place, they must learn to know God from his other great works, which proclaim his being, and attributes, as well as from his wise and tender œconomy in the government of all his creatures. If they should prove unacquainted with this branch of knowledge, then they are more ignorant than even the heathens, according to the testimony of St. Paul himself, which is accomplished by the writings of Pagans. How admirably among others *, Derham, and Nieuwentyt †, have applied natural philosophy to an unanswerable confirmation of revealed truths, is well known to those who have perused their excellent works with attention, and have from such perusal, either acquired their first belief and love of God, or found those religious habits greatly strengthened and animated. Moreover, a religious man, whose profession turns his attention to other secular sciences, must confess, that the delight of natural enquiries is greatly heightened to him, by an advantage which at first he did not expect, by the confirmation of his belief, and thus he is encouraged to pursue his researches, by the repeated satisfaction with which they are attended. Not to mention the occasion which a naturalist may take from his science, to remind himself and others of their duty towards God and their neighbour, and this agreeably to the method of the prophets, and the example of the great prophet Jesus himself, who referred those who are intemperately solicitous about worldly things, to the fowls of the air, and the lillies of the field; the disobedient to the oxen, and asses, which know their master; the slothful to the industrious pattern of the ant;

* Particularly in his physico theology, or a demonstration of the being and attributes of God, from the works of creation, being the substance of sixteen sermons preached at the lectures founded by the honourable Robert Boyle.

† In that learned and devout work, the religious philosopher, or a right use of the study of nature to the conviction of atheists and infidels. This conviction should be an especial incentive to further researches; as, without the least hypocrisy, I can say of myself, that the *γινώσκον τὸ Θεόν* the knowledge of the eternal, invisible Being, who is the scope and spirit of all the truths delivered by the prophets and apostles, and the *εἶναι αὐτὸς ἀναπολόγητος*, by which others also may be gained, not only irresistibly drew me into the study of natural history, but sweetens all the labours with which it seems to be attended, and enlivens the conversation of persons of the same taste, Henkels Pyriologie, or history of fire, Cap. v. p. 300.

and the negligent to the bird which knoweth its season. Thus the works of God serve for a basis and confirmation of natural theology, even as revealed truths are grounded in his word; and this hath induced some able men of our times to follow Derham's excellent plan, whose physics, and astro-theology were no sooner published, than others adopted the system; every one was stirred up to apply his particular knowlege to the discussion of some point of natural history, and exhibit such an account of it, as should tend most to spread the knowlege and glory of the Creator. These endeavours by no means deserve to be considered as unnecessary or superfluous, for all who are desirous of a more intimate acquaintance with the works of God, as arguments of his existence and attributes, have no time, or opportunity for that circumstantial examination of every part, which hath been undertaken and executed by Fabricius, in his pyro- and hydro-theology; Alvard, in his bronto-theology; Zornius, in his pitano-theology; Rathleff, in his acrido-theology; Lesser, in his litho- and testaceo-theology, &c.

I heartily join with the celebrated Linnæus * in wishing, that even those gentlemen in the universities, who are not peculiarly destined to physic, or the like, but to the study and promulgation of the word of God, in some ministerial office, were directed to apply such a part of their academic years to physics, as may equal, if not exceed the time spent in metaphysics, and logic, these last not being so indispensably necessary and useful as the former, especially to those who are called to attend a country parish. Here their natural knowlege will not only furnish them with many clear arguments, and edifying reflexions to themselves and their

* Monsieur Linnæus commence par une harangue, que lui dicte la vivacité de son inclination, pour l'histoire naturelle. Il s'attache à la félicité des peuples, dès qu'elle a été portée à un certain degré de perfection. Il s'adresse aux puissances, et les supplie d'introduire une science aussi utile dans les universités. On y enseigne la logique, la métaphysique et d'autres sciences de théorie, dont l'utilité est extrêmement éloignée du bien public, pendant qu'on ne devoit pas négliger l'histoire naturelle, qui enrichit une nation, parce qu'elle lui fait connoître ses richesses. Il souhaiteroit surtout que les jeunes gens, qui se destinent à la vie ecclésiastique, pussent se procurer une teinture de cette aimable science. Elle leur adouciroit la solitude de la campagne, et elle leur feroit faire des découvertes, que les savans des villes ne sont pas à même de faire, Biblioth. Raisonnée, Tom. xxxviii. p. 15.

hearers,

hearers, of which we have instances in many religious books of that kind; but it will besides prove a liberal amusement in their solitude; it will enable them, by much greater opportunities than the learned enjoy in towns, to make useful discoveries or improvements, from the products of nature, to the lasting benefit of their country, which it is their duty to promote. I shall mention only one thing, which here in Norway might be of the greatest importance, I mean such skill in metallurgy, as to know the species of ores and minerals, to make little experiments by fusion, and thus to form a judgment of the intrinsic value of a mine, and how far it will answer the expence of opening. He who is possessed of superior knowledge and penetration, may in this country, ever meet with many latent things, which might long since have occasioned much thought and reflexion, had they been exhibited earlier to public view and examination.

This leads me to my other motive, for attempting a natural history of Norway, which carried me thro' it with infinite delight, though I wanted the materials, the time, and the opportunities requisite for an essay of this kind. In the annual visitations of my diocese, which lead me into every part of this province, and sometimes form a journey of an hundred Norway miles, I have heard authentic accounts of natural things, and sometimes have seen the originals themselves, which being unknown to me, put me upon enquiring whether they were so to others, or whether they had a perfect knowledge of them? The latter being seldom the case, it was natural to wish the improvement of that knowledge, especially as those mountainous countries are distinguished from others by containing many things, which are met with in the province of Dauphiné in France. I refer the reader to the ninth volume of the *Memoires de l'academie royale des inscriptions et belles lettres*, where he will find the following passage; "Nature has bestowed on every province some distinguishing advantage, and the curiosities of each country are proportioned to the number and nature of the alterations it has undergone. Consequently,

quently, in provinces full of mountains, rocks, grottos, subterraneous cavities, and minerals, the speculative mind is entertained with many such natural phenomena, as are not to be found in other parts.

This observation of M. Lancelot, is entirely applicable to Norway, and more especially to that part where providence has been pleased to settle me, which, according to its name, almost wholly consists of mountains, in which, few parts of Europe can be compared to it, and consequently, according to the above observation, few contain more remarkable naturalia. Even Norwegians themselves, who resort hither from the other provinces, imagine themselves in a foreign country, not only on account of the continual high mountains they meet with; but in respect of the different and very unwholsom air issuing from off the sea and settling between the mountains, from whence it cannot easily be dissipated.

But Norway, considered in general, in the *singularia naturæ et providentiæ*, surpasses most countries, and not only in its inanimate treasures, such as metals, minerals, and vegetables, but in the various kinds of beasts, birds, and fishes; and particularly of the last, scarce any parts of the universe afford such a diversity and abundance. But these superior advantages are not estimated as such by the inhabitants, who daily enjoy, and therefore are too apt to disregard them. Foreigners seldom visit us, unless they are seamen and merchants; and these have little else in view, than the lucre of their professions. Northward of us the people are too unpolished to encourage a traveller to take the tour of the country, which hath been the means of clearing up the natural history of other countries.

On this very account it seems the more expedient, that such of our Danish nobility, and of our literary youth, who travel at a very great expence to visit foreign countries, should be first obliged to take, at least, a half year's tour through this kingdom, which is so closely united with Denmark. If the travels of

these young gentlemen are said to be undertaken upon worthy motives, I hope their principal object is to qualify themselves the better for the service of their king and country, in those public employments which at their return they solicit, and to which they have some claim. Now if this be their object, it is more necessary for them to visit Norway and Sweden, than all the other countries of Europe. An acquaintance with the latter (Sweden) both in respect to its strength and its weakness, is unquestionably more necessary to our young statesmen, than to be able to decide which merits the preference, the Rhenish, Italian, French, or Spanish wines. As to the necessity of an accurate knowledge of Norway, I believe it must be immediately manifest, if not to others, at least, to a Norwegian, when he sees a person filling some eminent post either in the state, or in the law, with irreproachable integrity, who is totally ignorant of the particular circumstances and properties of Norway, and wherein they totally differ from those of Denmark. Thus the public, contrary to his intentions, may suffer great detriment, or many things be neglected, which would be happily executed, if his public spirited views were directed by his own discernment, which would enable him without seeing thro' the eyes of other men, thoroughly to sift and examine the grounds and consequences of a matter, which now becomes doubly difficult, it being not only foreign to him, but very remote perhaps from the purpose, to which he is meditating to apply it.

In this respect, I flatter myself, this first essay towards a natural history of Norway, will have its use with some, who never had an opportunity of personally visiting a country, with which, by virtue of their office, they are in a greater or less degree, perpetually concerned.

This work, moreover, with all its imperfections, may serve to enrich natural history in general with some particulars, of which, consummate naturalists were heretofore the only competent judges. I am very far from desiring to relate, or establish marvelous

The AUTHOR'S PREFACE.

xi

lous things, merely to excite the admiration of the reader. On the contrary, I have endeavoured to rectify the erroneous idea which many, even among the learned, have, for want of better information, formed of several, in themselves very wonderful natural phænomena, here in Norway; such as a bottomless sea-abyss growing in the Moskoe-ström, penetrating quite thro' the globe; of ducks growing on trees; of a water on Sundmoer, which in a short time turns wood into stone; and many other such things, which, some who have had no opportunity of enquiring further, or others who were not disposed to it, have received as undoubted facts. The reader will meet with many strange, singular, and unexpected things here, but all of them strictly true; some of them not discovered before, others confirmed; and, to the best of my ability, in some measure accounted for, and illustrated.

Perhaps, Norwegians by birth, to whom the nature of their country is better known, may, from their own particular experience in divers parts, produce something more complete and extensive. If they should be animated thereto by this work of mine, I shall account it among the accidental advantages which may result from it; and in this case, let no one imagine that a difference of opinion, decently delivered, will give me any offence, or trouble; the discovery of truth, is in this and every other respect, my chief end; and I live in an age, which not content with mere hypotheses, unsupported by proofs, requires that every fact or position, which is advanced as real, be at least demonstrated possible, and consonant to the nature of the things in question.

Phyics, having never been my chief study*, I am far from the arrogance of supposing, that I have always hit upon the true original cause, and laid open the connexion of every subject; and I am much farther from the presumptuous conceit, that I have, in

* Si mihi homini vehementer occupato stomachum moveritis, triduo me jurisconsultum profitebor. Cicero in Orat. pro Muræna, cap. xxviii.

every particular, developed the abstruse measures, and discovered the secret designs of the infinite Creator, whose ways are past finding out. I hold with Bartholin. "*Officio suo satisfecit physicus, ubi rationes adduxit probabiles.*" It is not in one respect only that our Saviour's words hold good; *the wind bloweth where it listeth, and thou hearest the sound thereof, but thou knowest not from whence it cometh nor whither it goeth.* And the wise man does not exaggerate when he says, *we scarce perceive what lies upon the earth, or feel what is betwixt our hands.* However, our almighty and all-wise Creator cannot be displeased at an investigation of his works, with a pious and respectful docility, nor at the praises we give to his holy name for so much as falls within the extent of our faculties; resting assured, that what is beyond our reach in this state of probation, will be explained to us in that new heaven and new earth which we look for according to his promise.

I shall now, pursuant to my promise, give some account of the sources from whence I have drawn what is here offered to the public. These are partly writings relating to Norway, partly my own certain experience, as far as it extended, and partly the observations of some intelligent persons, communicated to me at my desire.

In the first class are our noted historians and chorographers, especially Peter Nicholas Undalin, formerly superintendant over the district of Lister, minister of Undal, in the diocese of Christianland, and a canon of the chapter of Stavenger, who, besides his translation of Snorre Sturlesen's annals, from the old Norwegian tongue into modern Danish, wrote a posthumous work, published at Copenhagen, in quarto, in the year 1632, intitled, *A True Description of Norway and the adjacent Islands.* Of this piece Dr. Christopher Steinkuhl, in 1685, published a German translation with additions. It gives a tolerable account of the extent of every province in general, its subdivision, and the names of the districts and parishes; with some particulars on the nature and

qualities of the soil; but these are but few in number, it not having been his design to treat expressly of them. Mr. Jonas Ramus, heretofore pastor to the community of Norderhong in Rongerige, in the diocese of Aggerhuus, goes further. This writer, besides many other theological and historical compositions, has deserved highly of his country for his Description of Norway, published in quarto, at Copenhagen 1715. It is a chorographical improvement upon Undalinus's work, but having the same point in view with that author, he confines himself within the same limits, yet is fuller on the nature and products of the country, adding, particularly at the close, from page 240 to 274, an appendix, enumerating the several beasts, insects, birds, fishes, herbs and trees. This consists indeed of little more than the bare names of them, but was of use however to me, as it opened a large field for further enquiry. Arendt Berendsen's Fertility of Denmark and Norway, printed in quarto at Copenhagen, in 1656, is a book which exhibits a clear account of the different fertility of the respective provinces, and several particulars concerning the products of the country; but this again proceeds no farther than giving the names of things *. In some certain points, I have been most indebted to Mr. Lucas Debes's Feroa Referata, or Description of the Ferro Islands, published at Copenhagen, in octavo, 1673. This gentleman, who was formerly superintendent of Ferro, was, for the times he lived in, and the opportunities he had, a good naturalist, and, as the islands he describes, lying parallel to the western coasts of Norway, have some analogy with them, especially on account of the sea-fish and water-fowls, his observations were of greater assistance to me than any other work. I have likewise gleaned some good materials from distinct treatises on single subjects, such as Wormius's Tractatus de mure Norvegico, Dethardingii Diff. de vermibus in Norvegia qui novi visi, Gartner's Hor-

* The Norrigra Illustrata of Jens Lauridsen Wolf, hardly deserves to be ranked among the chorographies of the country, it containing little of any importance but what is historical.

agricultura Norvegica, *Lochstor's Diff. de Medicamentis Norvegiae sufficientibus*, *Dasse's Description of Nordland*, &c.

The loss of the manuscript history of the beasts of Norway, by the above-mentioned Mr. Peter Nicholas Undal, is exceedingly to be lamented; it happened in this manner. The author had transmitted his work to his intimate friend Dr. Worm, that before it was committed to the press, it might undergo the revision of that consummate naturalist †. With him it remained till his death, when it fell into the hands of Dr. Thomas Bartholin, who carried it to his seat at Hagested in Silland, where, together with many other valuable books and manuscripts, it was unfortunately burnt. Undal, page 83 of his *Chorography*, mentions another book, called *Speculum Regale*, to which he appeals for what is said concerning a hazle stick being petrified in Birkedal morass, in Sundmoer, from whence I conclude, this book must have turned upon natural history; but as probably it was likewise a manuscript, it was a great pity that the public was not benefited by it, before it was lost, as is unquestionably the case. But a greater calamity to the literary world, was the conflagration which happened 1734, in the city of Christianfand, which destroyed that invaluable assortment of collections for a natural history of Norway, in which Mr. Jens Spidberg, an ecclesiastic of great eminence there, had with indefatigable application spent many years. He was a man consummately accomplished for so great an undertaking, as appears from the other monuments extant of his genius, which display a singular penetration and judgment, with an infinite compass of learning, especially in physics and mathematics. I shall here quote a passage from a letter, with which he favoured me, dated Dec. 10, 1750, concerning his design, which he relinquished after the unfortunate loss of his manuscripts and library. I should not have troubled the reader

† This, however, from the following mention made of it, by the said Mr. Worm, does not appear to have been a comprehensive or finished work: *Petri Undalini fragmenta historiae animalium Norv. MSS. quæ penes me sunt. Tr. de Mure Norveg. page 3.*

with this extract, but it contains some things relative to my present purpose.

It is to be lamented that hitherto no person has ventured to undertake a natural history of Norway; for I am persuaded that no country in the universe affords more curiosities and wonders, out of the three kingdoms, of nature, than this; and consequently, there is not a subject more fit for the pen of a naturalist. Had M. Maupertius gone as far as to Wardehuus, or to the north-cape, and there made his dispositions for taking the figure of the earth, his calculations would have been attended with less difficulty, and more certitude than at Tornea. Had M. de Mairan taken care to procure from Norway, some accurate observations on the Aurora Borealis, his valuable *Traité Physique de l'Aurore Boreale*, had been much more complete and decisive; for the north light takes its rise from Norway, and particularly from the diocese of Drontheim. Considerable additions might have been made to Redi, Swammerdam, and even to M. Reaumur's *Memoires des insectes*, had they had the advantage of a communicative, and observing correspondent in Norway, where are several tribes unknown either in Italy, Holland, or France. Linnaeus, by his observations in Sweden, has enriched botany more than Tournefort, by all the remarks he made in France, or in his travels to the Levant. I need only mention the article of metallurgy, in which Norway surpasses all other countries, producing all kinds of minerals and metals, from gold, to sulphur and lead. In like manner I pass over the numberless beasts, birds, and fishes peculiar to Norway; the rivers, hot springs, meteors, and the several alterations of the air, &c. but alas! all these things, such is the inconstancy and ignorance of the people, are still almost unknown; at least, I have not yet heard of any one equal to the task, who has attempted to place them in a proper light. Peter Nicholas Undal, to whom we owe a translation of Snorre Sturlesens, and a civil history of Norway, had, it seems, also composed a natural history, but it being sent to Copenhagen for approbation, was suppressed,

or at least not published; though a physical treatise written 130 years ago, would little suite the taste of these more enlightened times. The great Wormius in his *Musæum*, and Tho. Bartholin in his *acta medica*, and *historica anatom. rariora*, have, I know, introduced some of the curiosities of Norway, but their accounts are defective. Jonas Ramus was distinguished by a knowledge of the history and antiquities of his country, but was not eminent as a naturalist. About five or six years ago, Count Reufs, who was then governor here, ordered all the litterati in these parts to send in an account of every particular in their respective countries which might contribute to the melioration of the soil, or the improvement of agriculture. Some such memorials were delivered in; but of what use they were, or whether any measures were taken in consequence of them, I have not heard. It may be presumed that the like orders were issued in the other dioceses. Mathematics, and natural philosophy have always been my favourite studies, and in my late library I was possessed of most and the best physical writings published in Italy, France, Germany, and England. It was Scheuchzer's *Natural History of Switzerland*, that first induced me to undertake a work of the same kind on Norway; and I had an opportunity of personally making the best collections and observations for that purpose, being ordered by baron Lowendahl, who commanded in chief in Norway during the last war, to draw a map of the country, and frontiers betwixt Norway and Sweden; a copy of which, I am informed, is in the *Collegium Curiosum* at Copenhagen. This undertaking gave me an opportunity of travelling thro' the diocese of Christianland, and of observing all the rivers, lakes, mountains, and every thing relative to natural history; but afterwards, whilst I was employing my leisure in augmenting and digesting my collections, in order for publication, that deplorable fire which happened in Christianland 1734, deprived me, besides 6000 volumes in all languages and science, of all my collections and manuscripts, so that my whole stock was reduced to what I had treasured up in my memory,

mory, and I have since acquired by subsequent observations. I had before published two little pieces, one in Holland, de causa et origine ventorum, the other at Hall in Saxony, of the North-light. I can still amuse myself, with the entertainment I receive in my leisure hours, from books of Mathematics, and natural philosophy." So far M. Spidberg.

It is therefore a melancholy consideration, that so few having made any advances towards a natural history of Norway, their collections should be thus destroyed; which, from several causes, has been the fate of many excellent writings among us. Concerning the neglect of natural history, or the great scarcity of such writings in the northern countries, the learned Muller, in his Isagoge ad Hist. Chersones. Ambricæ, cap. xi. p. 10. thus expresses himself: "Historiæ chorographicæ cognata est naturalis, quæ licet infinita rerum ἀξιοθαυμάσιων varietate in regionibus hisce luxuriat, et curiosorum calamos atque ingenia provocet, pauci tamen hæctenus partem illius aliquam illustrandam sibi sumpserunt." This likewise is the complaint of Dr. Henry Lochstor, whose death in the maturity of life, and in the midst of many useful designs, was a public loss; in his dissertation De Medicamentis Norvegiæ sufficientibus, p. 20, he says, "Monendum duxi, haud deesse Norvegiæ fontes medicatos, deesse autem, qui horum vires et principia inquirant solertes naturalium rerum studiosos." If we consider the natural cause of this, it will not appear matter of complaint, tho' the effect is so in a great degree. In a country so healthy as Norway, a few physicians will suffice, and consequently, there are few who devote themselves to physical researches.

From these several circumstances it will be easy to conclude, that I had not a multiplicity of sources from whence to draw many choice materials. The discoveries which I have been able myself to make, either by my own experience, or enquiries, or experiments, have furnished my principal aids. My annual visitations, as has been intimated before, gave me the best opportu-

nities, and great encouragement. Almost every inn in this extensive diocese, gratified my curiosity, and yet this is not the only province known to me from my own experience. The diocese of Drontheim is the only one I have never been in, the others I have travelled through, and in several places in that of Aggerhuus made some stay, and always took care to find out a person, who was able to satisfy me in any questions concerning the nature and circumstances of the country. But the diocese of Bergen, as will be easily imagined, is the country of which I have had the most perfect knowledge, both from experience and information. These circuits usually take up two or three months, and leaving me more vacant time than I could wish, I usually, according to the proverb, make a virtue of necessity, by spending part of the time in conversation with the guides and drivers, appointed at different stations to attend upon me with carriages. Their answers to my several questions, I afterwards examine with the ministers of the parishes, or some other person well acquainted with the country, and whatever I hear confirmed by several testimonies, or not controverted, or doubted of, I enter among my miscellaneous observations, and, at my return home, compare them with the descriptions of such countries, especially the mountainous, or which are in any other respect analogous to Norway. These annual tours I have also improved towards making a small collection of naturalia of Norway, such as stones, ores, fossils, sea-trees, corals, snails, muscles, uncommon birds, fishes, and the like; of the most remarkable of which, for the gratification of the reader, I have caused prints to be annexed.

Lastly, on the subject of the Norway-birds, and more particularly the fish, I have had recourse to the observations of men whose dwellings and employments give them opportunities of examining more minutely things, which do but seldom fall under general observation. As to fish and marine-animals, a greater variety, and stranger tribes are seen hereabouts, and off Nordland, than in any part of Europe; but a superstition which prevails
among

among the lower class of people, deprives us of most of these, for, when they happen to catch a fish of a strange, singular figure, consequently the greater subject of curiosity, they are sure immediately to throw it over-board; to those of the monstrous species the peasants give the general appellation of troid, devil, or troid-fish, devil-fish, and are weak enough to imagine, that unless it be immediately set at liberty, their fishing will be unsuccessful, and something or other amiss will certainly befall them.

I have now, delivered what I principally intended in this preface, I shall only repeat the before-mentioned declaration, that I do not send this essay abroad as a master-piece, and shall rejoice to see it improved by more interesting articles, and more refined observations; and to see a complete superstructure raised on this foundation, by persons of more leisure and opportunity.

However, I own myself entirely in the sentiments of a very eminent writer on the like occasion, who, in his first essay of a natural history of Hungary, asserts the claim of an original writer to the indulgence of the public, in the following words; "*Res omnino remotas è sua, ut ita dicam, barbarie primus exemi; propterea veniam mereri, videor, mihi, si nec omnia eruerim, nec omnia correctè . . . sentio inesse multa quæ corrigi, deesse quæ valeant suppleri* *". Had I not judged this work to stand in need, or to admit of any amendment, I should not so frequently have called it an essay in this preface; but it is, indeed, the first essay on this subject, and of course encumbered with difficulties too great for the application and talents of one man; and on this ground, I hope that every candid judge, who knows how little leisure my indispensable functions leave me, will not require more, or a more perfect work of this kind from one, who may appear to have performed more than could be expected, who has denied himself many hours of natural repose, if not suffered

* Aloysius Comes Marfilli in Danub. Panon. Myfic. Tom. 1. Præfat.

The AUTHOR'S PREFACE.

by his assiduity in other respects *, but this I shall never regret, if, in any measure, I can contribute to promote the glory of God, and the public welfare.

Bergen, May 1. 1751.

* Qui multa agit, sæpe fortunæ potestatem sui facit, quam tutissimum est raro experiri. Seneca de Tranquillit. Anim. Cap. xiiii.



A LIST of the AUTHORS quoted in this Work.

A.

A BILGAURD Petr.
Acta Medica Hafniens.
Acta Societ. Reg. Hafn.
Acta Uratislaw.
Ælian.
Aldrovandus Ulysses.
Anderson John.
Arbuthnot John.
Aristotle.
Arreboe Andr.
Athenæus.

B.

B ANG Oluf.
Bartholin Thomas.
Bellonius.
Berndsen Arndt.
Bertius.
Bibliothèque Britannique.
Bibliothèque Germanique.
Bibliothèque Raïsonnée,
Bibliothèque Philosophique.
Bochart Samuel.
Boyle Robert.
Bonnet Charles.
Borner Nicol.
Borrichius Olaus.
Bremenfis Adam.
Brommel Magnus.
Brown Sir Thomas.
Buchanan.
Buchwald John.
Buffon M.
Burnet Thomas.
Bussæus Andr.
Buxbaum Jo. Christ.

C.

C AMBRENSIS Giraldu.
Camererius Elias.
Cartesius Renat.
Careri Gemell.
Chardin M.
PART I.

Charlevoix Pere.
Cicero.
Cleffel Joh.
Clercle Joh.
Clusius.
Cnoxen Jac.
Commentarii Academ. Petropol.
Condamike M.
Cragius Nicol.
Crantzius Albert.

D.

D ALECAM P Jac.
Dalin Olaus.
Dampier.
Dapper Odoard.
Dass Petr.
Daubenton M.
Debes Lucas.
Delices de la Suisse Anon.
Derham William.
Desaguliers.
Detharding Georg.
Diodorous Siculus.
Dolmer Jens.
Duvernoi.

E.

E GEDE Joh.

F.

F EUSTKING Henr.
Flemming Hans.
Frantzius.

G.

G ARTNER Christian.
Gefner Cunr.
Glyfing Joh.
Gram Joh.
Grammaticus Saxo.
Griffin Hugues.

f

Grotius

Grotius Hugo.

H.

Du **HALDE** P.
Happelius Ewerb.

Hartfœker Nicol.
Haffæus Theodor.
Heitman Joh.
Herbinus M.
Henkel Joh.
Hierné Urban.
Holberg Ludov.
Horrebow Nicol.
Howel James.
Hvitfeld Arild.
Högström Petr.

J.

JABLONSKY Theod. Joh.
Jacobæus Oliger.
Jonæ Arngrim.

K.

KÆSTNER Abraham Gottf.
Kircher Athanaf.
Klein Jacob.
Kraft Jens.

L.

LABAT Pere.
Lange Gottf. Henr.
Leibnitz B.
Lesser Frid. Christ.
Linnaeus Carol.
Löchstör Henr.

M.

MAGAZIN of Dantzick.
Magazin of Hamburg.
Magazin of London.
Magnus Olaus.
Margravius Georg.
Marfili Aloyfius.
Martens Fridr.
Martin M.
Mead Richard.
Mejerus Michael.
Memoires de l'Academ. des Scien-
ces.

Mercator Gerhard.
Molesworth M.
Mufckenbroeck.

N.

NEWTON Sir Isaac.
Neukrantz.
Nickols M.
Nova Litteraria Maris Baltici.

O.

OLAVIUS Stephan.
Olearius Adam.
Opian.
Owens Dr.

P.

PARÆUS Ambros.
Paracelsus Theophrast.
Paris Matth.
Patrick Simon.
Pauli Sim.
Peirere Isaac.
Plato.
Pliny.
Plutarch.
Polignac Cardinal.
Pococke Rich.
Pontanus Jo. Isaac.
Pontoppidan Erich, Sen.
Pope M.

R.

RAMUS Jonas.
Ramus Joach. Frid.
Ray Joh.
Reaumur Monfr.
Reitzer Christ.
Resenius Pet. Joh.
Rhodius Ambros.
Rohault J.
Riccioli.
Rollin Carol.
Rondeletius.
Rudbeck Olaus.

S.

SCALIGER Jul. Cæs.
Schachtius Hern. Matth.
Sheffer Joh.

Scheid

Scheid Christ Ludov.
Scheuchzer Joh.
Schmidt Joh.
Schott Gaspar.
Schurtzleisch Conr. Saml.
Schöning Gerrh.
Schönveld Stephani.
Seebald Henr.
Sevel Frid. Christ.
Shaw Dr.
Sibaldus Robert.
Silius Italicus.
Spelman Joh.
Sperling Otto.
Spidberg Jens.
Steinkuhl Christ.
Strabo.
Sturlesén Snorro.
Svammerdam Jo.
Svedenborg Eman.

T.

TACITUS Cornelius.
Tavernier Jo. Bapt.
Tilas Daniel.
Torfæus Thormod.
Tornæus Joh.
Transactions Philosoph.

Tulpius Nicol.
Tournesfort Pittoni.

V.

VALENTINI Mich. Bernh.

W.

WALLACE Dr.
Wentzky Georg.
Wetenzk. Academ. Swenske Af-
handl.
Whiston William
Willoughby Francis.
Windheim C. E.
Wolf Christ.
Woodward Dr.
Worm. Olaus.

U.

UNDALINUS Petr. Claud.

Z.

ZELTNER Gustav.
Zornius Joh. Henr.



THE
CONTENTS

TO PART I.

CHAPTER I.	
Of the Air and its Phenomena.	Page 1
CHAP. II.	
Of the Soils and Mountains of Norway.	35
CHAP. III.	
Of the WATERS.	66
CHAP. IV.	
Of the Fertility of Norway in variety of Vegetables.	96
CHAP. V.	
Account of the Vegetables continued.	115
CHAP. VI.	
Of the Sea-Vegetables of Norway.	148
CHAP. VII.	
Of several kinds of Gems and curious Stones in Norway.	160
CHAP. VIII.	
Of the Metals and Minerals in Norway.	178



The Northern part of Norway reduced to a lesser Scale, containing Finmark, and the adjacent Islands

A Scale of Miles
Common Measure, Miles to a Degree
German and Dutch Measure, Miles to a Degree
Large French Measure, Miles to a Degree
English Miles 60 to a Degree



Chief Cities of Provinces
• Lesser Cities
• Great Towns
• Small Towns
• Villages
• Archbishops see
• Bishops see

N.B. The Kingdom of Norway is subject to the King of Denmark but the Government of Babur was yielded to the Swedes by the Treaty of Roschild in 1658, as was also a part of Drontheim called Hernad by the Treaty of Copenhagen in 1660.



An accurate MAP
of the
KINGDOM of NORWAY,
containing 5 general Governm.
or Dioceses, Viz?
Aggerhuys Bergen
Drontheim, Wardhuys,
and Bahus.

By John Baptist Homman,
Corrected by Martin Stelmer,
Professor of History at the
University at Copenhagen.

A Scale of Miles
English Miles to a Degree
Dutch Miles to a Degree
German Miles to a Degree
Large French League to a Degree

THE
NATURAL HISTORY
OF
NORWAY.

PART I.

CHAPTER I.

Of the Air and its Phenomena.

SECT. I. *Of the climate of Norway, and diversity of the atmosphere in general.*

SECT. II. *Of the day-light and length thereof.* SECT. III. *Of the aurora*

borealis, and sea-light, in the night. SECT. IV. *The winter very mild and*

seldom severe, or lasting, on the west side. SECT. V. *The wise and bountiful*

design of providence in this. SECT. VI. *Natural cause of it.* SECT. VII.

The winter most severe in the eastern parts. SECT. VIII. *Cautions and pre-*

servatives against it. SECT. IX. *Violent heats in summer, and their causes.*

SECT. X. *False notions of foreigners concerning the air of Norway.* SECT.

XI. *The property of that air with respect to health and sickness.* SECT. XII.

Rains, and a humid air, on the west side. SECT. XIII. *Advantages arising*

from thence agreeably to the designs of the Creator. SECT. XIV. *Difference*

of weather in countries contiguous to each other. SECT. XV. *Deep snows,*

especially on the mountains, together with the advantages and detriment thereof.

SECT. XVI. *Regular and irregular winds.*

SECT. I.

THE air, together with the light, warmth, humidity,
and other properties thereof, varies much more in Norway
than in most European countries. This may well be con-
cluded, without personal experience, from the vast extent
of the country, of 300 Norway-miles * from cape Lindefnaes south,

The climate,
and various
atmosphere
of Norway.

* The common miles of Norway are computed to be about one fourth larger than a German mile, at which rate they are near equal to five or six measured English miles.

to the north cape on the borders of Russia. Thus M. Ramus, so justly celebrated for his history of the civil transactions and antiquities of his country, in the Chorographical description of Norway, computes its length from Lindefnaes in the diocese of Christianland, which lies in 58, or, more precisely, in 57 degrees, 47 minutes latitude, to the north cape at the extremity of Finmark, at 71 degrees and half, to be in a direct line, or through the air, 202 miles and a half, but he finds that the circuit across the mountains and vallies, or by water, from one cape to the other, increases it to above 300 miles, and its breadth from the frontiers of Sweden westward, to cape Statt near Sundmoer, in 21 degrees of longitude from the Canaries, is 65 miles, but from thence, the country becomes gradually narrower towards the north. I have no particular knowledge of that part of Norway called Finmark, which lies in the frigid zone, or near the polar circle. It is the country of Norway, properly so called, at the extremity of the temperate zone, that is here to be chiefly treated of, and it is the air of this country, which I affirm to vary considerably in respect of the degrees of heat and cold, light and darkness.

S E C T. II.

Day-light
and length
of the day.

In this and most other points, I shall chiefly regulate my observations by the horizon of Bergen, not only as it happens to be the place of my residence, but as its latitude, being 61 degrees 15 minutes, with respect to north and south, lies nearly in the middle of Norway * properly so called. The longest day at Bergen consists of 19 hours, the sun rising at half an hour past two, and setting at half an hour after nine; and the shortest is only six, the Sun not rising before nine, and setting at three.

The gradations of the increase and decrease of day-light, are clearly exhibited in the following table.

* At Bergen in Norway, Gefle in Sweden, Nyftad in Finland, and Wyburg in Carrelia; as being at parallel distances from the equator, the days and nights are of the same length. But at Bergen it is noon at the very same instant, as at Utrecht in Holland, Marseilles in France, and Constantine in Africa.

NATURAL HISTORY of NORWAY.

3

The rising and setting of the Sun in the horizon of Bergen, in the 61st degree of latitude, according to Pontanus.

January.			February.			March.			April.		
	Sun rises	Sun sets		Sun rises	Sun sets		Sun rises	Sun sets		Sun rises	Sun sets
1	8 $\frac{1}{2}$	3 $\frac{1}{2}$	4	7 $\frac{1}{2}$	4 $\frac{1}{2}$	2	6 $\frac{1}{2}$	5 $\frac{1}{2}$	5	4 $\frac{1}{2}$	7 $\frac{1}{2}$
11	8 $\frac{1}{2}$	3 $\frac{1}{2}$	10	7 $\frac{1}{2}$	4 $\frac{1}{2}$	6	6 $\frac{1}{2}$	5 $\frac{1}{2}$	11	4 $\frac{1}{2}$	7 $\frac{1}{2}$
20	8 $\frac{1}{2}$	3 $\frac{1}{2}$	14	7 $\frac{1}{2}$	5 $\frac{1}{2}$	11	6 $\frac{1}{2}$	6 $\frac{1}{2}$	16	4 $\frac{1}{2}$	7 $\frac{1}{2}$
25	8 $\frac{1}{2}$	4 $\frac{1}{2}$	19	6 $\frac{1}{2}$	5 $\frac{1}{2}$	16	5 $\frac{1}{2}$	6 $\frac{1}{2}$	21	4 $\frac{1}{2}$	8 $\frac{1}{2}$
30	7 $\frac{1}{2}$	4 $\frac{1}{2}$				21	5 $\frac{1}{2}$	6 $\frac{1}{2}$	26	3 $\frac{1}{2}$	8 $\frac{1}{2}$
						26	5 $\frac{1}{2}$	6 $\frac{1}{2}$			
						31	5	7			
May.			June.			July.			August.		
	Sun rises	Sun sets		Sun rises	Sun sets		Sun rises	Sun sets		Sun rises	Sun sets
1	3 $\frac{1}{2}$	8 $\frac{1}{2}$	2	2 $\frac{1}{2}$	9 $\frac{1}{2}$	4	2 $\frac{1}{2}$	9 $\frac{1}{2}$	4	4 $\frac{1}{2}$	7 $\frac{1}{2}$
7	3 $\frac{1}{2}$	8 $\frac{1}{2}$	7	2 $\frac{1}{2}$	9 $\frac{1}{2}$	9	3 $\frac{1}{2}$	9 $\frac{1}{2}$	6	4 $\frac{1}{2}$	7 $\frac{1}{2}$
12	3 $\frac{1}{2}$	9 $\frac{1}{2}$	13	2 $\frac{1}{2}$	9 $\frac{1}{2}$	14	3 $\frac{1}{2}$	8 $\frac{1}{2}$	14	4 $\frac{1}{2}$	7 $\frac{1}{2}$
22	2 $\frac{1}{2}$	9 $\frac{1}{2}$	18	2 $\frac{1}{2}$	9 $\frac{1}{2}$	19	3 $\frac{1}{2}$	8 $\frac{1}{2}$	19	5 $\frac{1}{2}$	7 $\frac{1}{2}$
28	2 $\frac{1}{2}$	9 $\frac{1}{2}$	23	2 $\frac{1}{2}$	9 $\frac{1}{2}$	24	3 $\frac{1}{2}$	8 $\frac{1}{2}$	25	5 $\frac{1}{2}$	6 $\frac{1}{2}$
						29	4	8	31	5 $\frac{1}{2}$	6 $\frac{1}{2}$
September.			October.			November.			December.		
	Sun rises	Sun sets		Sun rises	Sun sets		Sun rises	Sun sets		Sun rises	Sun sets
4	5 $\frac{1}{2}$	6 $\frac{1}{2}$	4	6 $\frac{1}{2}$	5 $\frac{1}{2}$	5	8 $\frac{1}{2}$	3 $\frac{1}{2}$	6	9 $\frac{1}{2}$	2 $\frac{1}{2}$
14	6 $\frac{1}{2}$	6 $\frac{1}{2}$	9	7 $\frac{1}{2}$	5 $\frac{1}{2}$	11	8 $\frac{1}{2}$	3 $\frac{1}{2}$	12	9 $\frac{1}{2}$	2 $\frac{1}{2}$
19	6 $\frac{1}{2}$	5 $\frac{1}{2}$	14	7 $\frac{1}{2}$	4 $\frac{1}{2}$	17	8 $\frac{1}{2}$	3 $\frac{1}{2}$	17	9 $\frac{1}{2}$	2 $\frac{1}{2}$
24	6 $\frac{1}{2}$	5 $\frac{1}{2}$	20	7 $\frac{1}{2}$	4 $\frac{1}{2}$	28	9	3	22	9	3
			25	7 $\frac{1}{2}$	4 $\frac{1}{2}$						
			31	8	4						

A particular herein observable, is, that as in the beginning of the year the day-light increases with remarkable celerity, so it decreases at the approach of winter in a like proportion. In the middle of February, I have been able to read without difficulty at six in the morning, which at the same hour in October was not possible; the cause of this, being manifestly the inclination of the earth towards the poles, needs no further explanation.

In the summer nights the horizon, when unclouded, is so clear and luminous, that at midnight one may read, write, and do every kind of work as in the day; this I have often experienced, even when age had brought me to the use of spectacles. Christian V. during his stay at Drontheim, in June, 1685, used to sup at midnight, without the use of lights. In the district of Tromsen, which is properly the extremity of Norway, towards the islands of Finmark, the sun is continually in view in the midst of summer, and is observed to circulate day and night round the north pole, contracting its orbit, and then gradually enlarging it, till at length it

Clearness of the summer nights.

it leaves the horizon, so that in the depth of winter it is invisible for some weeks *, and all the light perceived at noon is a faint glimmering of about an hour and half's continuance, which, as the sun never appears above the horizon, chiefly proceeds from the reflection of the rays on the highest mountains, the summits of which are seen more clearly than other objects. However, this glimmering is not the only light with which the inhabitants of these northern provinces are provided for their fisheries, and other employments, in the open air. The wise and bountiful creator hath afforded them all possible assistance, for these and other purposes. Besides the moon-shine, which by reflection from the mountains, is exceedingly bright in the valleys and creeks, these northern people, as well as the peasants, and fishermen in the diocese of Bergen, when their day-light is contracted to six hours, find considerable relief from the north-light called *Aurora borealis*; it often affording them all the light necessary to their ordinary labors, especially as it is now both here and elsewhere more frequent and extensive than formerly.

S E C T. III.

The *Aurora borealis*, and sea-light in the night.

This light in the air †, which here, and in Sweden, is known by the name of *Værlios*, *Lyfnar*, *Lyfanigar*, and *Lottetskien*, is elsewhere generally called the north-light, as usually issuing from the north, and its appearance mostly known to the northern people, although the real cause of it be here, no less than in other parts, a very dark problem, and involved in many uncertainties. I shall the less presume to advance any thing as certain and decisive on this head, since counsellor Ramus, a native of Norway, and a celebrated mathematician, hath not ventured to

* Even in these provinces, where, I have already observed the shortest day to consist of six hours, there are also some few parts so inclosed within the steep mountains, that for several months they cannot see the sun's disk, though its beams are visible to them. As I passed in my visitation through the island of Laerdahl, the master of the house where I lodged, assured me, that he, and his next neighbour, were blessed with the sun's appearance, not more than four months of the whole year, namely, from the middle of April, to the middle of August; yet others, at the distance of but a quarter of a mile, where the valley widens, could see it as usual. This must be the condition of some of the inhabitants of the Alps, especially about Monte Cenis, which separates Savoy from Piedmont, where, in some valleys, though the sun does not appear during the whole winter, yet the inhabitants enjoy the necessary day-light.

† In England, and especially in the north parts, where the north light is also well known, it is by reason of its desultory motion, called *Morrice-dancers*, *Merry dancers*, and *streamers*.

account for it, and nothing of this kind is found even in the *Acta Societatis Hafniensis*, T. I. No. IX. and T. III. No. VI. where it might most naturally be expected, as these pieces contain historical and physical accounts of this very light, with several plates, representing the observations made in many parts of Europe, on the various figures of the northern lights. In the year 1741, the son of Capt. Heitman, another great naturalist of Norway, published a posthumous piece of his father's, on the heat of the sun, &c. and likewise on the north-light. His system of the means and manner by which the sun influences our earth, and the other planets, at such an immense distance, through the æthereal expanse, is certainly very ingenious, but I am cautious of subscribing to it, as it opposes the doctrines of Newton, Wolfius, Reinbeck, and other eminent mathematicians; yet his thoughts on the north-light, as he was both a person of great erudition and experience in philosophy, deserve to be here inserted along with other conjectures, especially as he there treats of another phenomenon analogous to it, namely, a sea-light, or a luminous appearance in the water, called by the Norwegians, *Moor-Ild*. His sentiments on both these subjects are as follows: " Thus it is observed in the frigid zone, that the force which gives motion to the high winds, is there at its utmost height; insomuch, that sometimes the lower region of the air, which is filled with nitrous vapours, is whirled round, and then is formed that light in the air called the *Aurora borealis*, or north-light: yet this is a light void of heat, and of the same nature with that light which the people of Norway call *Moor-Ild*, and takes its rise nearly from the same cause as the *Moor-Ild*, the latter proceeding from an agitation of the salt-water in a dark night, which hath been every year observed by the herring-fishermen, when towing their nets along in a calm; for the sea appears in a kind of flame, as far as the nets reach, whereas before the motion of the nets, not the least glimpse of light was discernible. In fresh-water lakes, there is no such flame apparent; it being formed by the saline particles, which upon a motion of the sea begin to sparkle, and cause an effulgence *. The same has been likewise observed in

* This sparkling fire in the sea, shall be treated of more at large in chap. 3. sect. 8. when we come to treat of the sea, to which it properly relates.

navigation: for as in a dark, calm night, the course of a fish is perceivable by a long and increasing track of light upon the water, so the water, behind a ship under sail, appears luminous to a considerable distance.

It is not at all times, however, that this igneous effulgence is to be seen in the sea; but it frequently happens at an approaching alteration of the weather, and on the change of the winds to south-west, when the saline particles of the sea are thrown into a kind of fermentation. In like manner, the northern-lights do not always appear, but only at particular seasons, when the saline corpuscles of the air are agitated by a natural fermentation. But the proper rationale of this fermentation, and ascent of the saline particles of the sea and air, is best known to naturalists, whose researches turn on things of this nature. However, it is a general observation among expert northern navigators, and the fishermen who live along the coast of Norway, that when the north-light mostly appears to the westward, it is a prognostic of a south-west wind; which confirms the opinion of the naturalists, that some regions of the air, as well as of the sea, abound in saline corpuscles more than others, and these, at certain times, create a ferment, and diffuse a light through the air. Although this most frequently presages the above-mentioned change of weather, yet, there is often a considerable interval, before the change actually takes place. It is however certain, that the cold regions of the air contribute greatly to the change and boisterousness of the weather; particularly when the north-light has a copper-tinge, a violent storm, at west and north-west, may be certainly expected, though the weather may for a week after continue favorable to navigators, before the storm comes on. Of this I have seen many instances.

In this fermentation of the air the cold is abated, and if it extends so far as to rarify the air of the atmosphere, this is called mild weather: And when, by the elevation of the inferior air, it is the more compressed against that region, which is saturated with nitrous exhalations, so that the wind in the inferior air sets the lower part of the cold region in some motion, this causes those corruscations in the air, which are called the north-light. In those years, when the winter is unusually severe, these northern

thern lights are seldom or ever seen; the air being too far oppressed and condensed by the intenseness of the cold, to force itself upwards against the nitrous region, and communicate to it that motion which produces the north-light, before the lower air again expands itself by fresh fermentations."

Thus far M. Heitman, whose observations in some measure confirm the general opinion of its being a kind of fulgur brutum, or lightning without thunder; consisting, as lightning generally does, of inflamed sulphureous particles, but burning with much less vehemence. Dr. Nicholas Boerner, in his *Physics*, chap. xi. p. 284. is expressly of this opinion, viz. "that the north-light is nothing but saline, sulphureous vapours, kindled in the upper air, by a change it undergoes in autumn, spring, and at other times, when the sun has not power sufficient to rarify and disperse these sulphureous particles." Or, to make use of the words of the celebrated Wolfius, "it is a substance as yet immature for lightning; of which he treats in a particular dissertation; or, an imperfect tempest, as he calls it in sect. 335, of his *rational Reflections on the works of nature*." This opinion may be further corroborated by the following circumstance: Some persons of credit, who live in this country, have assured me, that these *Fulgura spuria*, are not always without a crack or sound, for in a glaring north-light, and calm weather, a distinct sound has been heard, with an explosion in the air, like the sudden breaking of the ice. Another opinion concerning the north-light, is, that it is no more than a mere refraction, or reflection of a flame issuing from certain volcanoes, which, in favour of this conjecture, are supposed to lie beyond Greenland, near the north-pole. But this position is too weak to build any thing on, or to be generally admitted. There are many, however, who consider the northern lights only as a mere reflection, or reverberation, tho' not from the flame of any volcanoes, but from the sun itself, when far below our horizon it meets with some evaporating clouds, at such a height as to be within the contact of the sun's beams in their ascent.

This is the opinion, for which Dr. Ventky of Prentslau declares in his third publication of *Miscellaneous Observations*, drawn from the celebrated M. Euler's enquiry into the north-light,

light, which is to be found in the second part of the *Histoire de l'Academie*. This hypothesis requires the following concurrence of causes; first, there must be vapours in the upper regions of the air; next, some clouds of that sort, and these at a vast height, and in the north; and they must not only emit vapours, but be illuminated and irradiated by the sun, when it is invisible to us; and of consequence, the sun must be visible to us at such time, if we stood as far above the horizon as the said clouds. And lastly, there must be a north-wind in the same upper region of the air to set it in motion, and to give a disposition to the figures, which so suddenly change their appearance. It is possible, that the experience of posterity may suggest something more probable.

The author's
opinion con-
cerning the
north-light.

If I may be allowed, or expected, to add any opinion of my own on this problematical subject; it may perhaps be not more improbable than what hath been already alleged, if we admit, that the original cause of the north-light lies in the electricity of the ethereal air; and, consequently, that it has existed at all times, and in all places, tho' not visible to us, without a concurrence of such concurrent circumstances and junctures, as I shall here exhibit. It is not above twenty years, since the electrical experiments have become generally known, and as they have excited the attention of all lovers of natural knowlege, they have likewise filled them with hopes, that this discovery would open a way to the solution of many more mysteries in nature. I flatter myself with the same expectation; but the first experiment of any importance, which has occurred to me, relates to this very point of deducing the north-light from the electrical, feeble, and subtile fire of the air, which by means of the more rapid circumvolution of the globe on its poles, or axis, excites a more vehement concussion, or agitation, in the air of the northern climates, and thus displays the electricity of the ethereal air most conspicuously in those parts. I was first led into these reflections sometime since by a conversation with a friend of mine, a very ingenious naturalist, who shewed me a remarkable passage in the *Bibliothèque Britannique*, Tom. XXI. P. II. pag. 336. where, among other extracts from the *English Philosophical Transactions*, is part of a piece of M. Defaguliers, intitled, A Dissertation

tion concerning electricity. The scope of his demonstrations is something different, viz. to shew the true cause of the ascent of rain-water, and the power by which it remains floating in the air, which is at all times much lighter than water. But as the investigation of one truth often proves introductory to another, so in this passage the writer seems to direct us to a clearer insight into the origin and nature of the north-light. I shall therefore insert so much of that passage here, as relates to our purpose. In order to apprehend his meaning, we must recollect with the learned writer, that Mr. Du Fay's observation, "that there are two sorts of electricity," is proved by observations and experiments; and that the electrical bodies of a vitreous electricity mutually repel one another, whilst they attract those of a resinous electricity; also that those of a resinous electricity repel one another, and attract those of a vitreous electricity.

"I suppose, says Dr. Desaguliers, particles of pure air to be electric bodies always in a state of electricity, and that vitreous electricity.

1st, Because particles of air repel one another without touching, as has been deduced from experiments and observations.

2dly, Because when the air is dry, the glass-tube rubb'd (or only warmed) throws out its effluvia, which the air drives back to the tube; from whence they dart out anew, and so move backwards and forwards with a vibratory motion, which continues their electricity.

3dly, Because the feather made electric by the tube, and darted from it, keeps its electricity a long time in dry air; whereas when the air is moist, the moist particles, which are non-electrics, floating in the air, and being attracted by the feather, adhere to it, and soon make it lose its electricity; which also happens even to the tube in a little time.

From this consideration it will be easy to account for a famous experiment of the late Mr. Hauksbee, which is this:

Having pump'd out all the air from a glass-globe, he caus'd it to turn on its axis very swiftly by means of a rope with a wheel and pulley; then rubbing the glass with his hand during its motion, there appear'd a great deal of light of a purple colour within the globe, without any light or attraction observ'd on the outside of the glass, which is observ'd when the air has not been pump'd

PART I.

D

out.

out. Then turning the cock so as to re-admit the air gently into the globe during its motion, the light was broken and interrupted, diminishing gradually, till at last it appeared only on the outside of the glass, where it was accompanied with attraction. Does it not appear that the external air, by its electricity, at first drives back the electric effluvia of the glass, which go then to the inside of the globe, where there is the least resistance? For we observe that as the air comes in, it repels the electric effluvia, that go inwards no longer when all the air is come in. If the fact be so, as the experiment shews, is not my conjecture proved, viz. that the air is electrical?

In the reverend and learned Dr. Hales's *Vegetable Statics*, several of his experiments shew, that air is absorbed, and loses its elasticity by the mixture of sulphureous vapours, so that four quarts of air in a glass-vessel will, by the mixture of those effluvia, be reduced to three. Will not this phenomenon be explained by the different electricity of sulphur and air? The effluvia of sulphur, being electric, repel one another: and the particles of air, being also electric, do likewise repel each other. But the air being an electric of a vitreous electricity, and sulphur of a resinous electricity, the particles of air attract those of sulphur, and the *Molecularæ* compounded of them, becoming non-electric, lose their repulsive force."

The judicious reader may, of himself, apply this passage to the north-light; and perhaps, by a mature discussion of it, strike out clearer ideas of that phenomenon, than I can develop, who only undertake to set down a few things, which have occurred to me.

The terrestrial globe, together with its atmosphere, may be considered as the glass-globe of the electrical machine. Upon the air being exhausted, and the globe whirled about with velocity, there appears within it a purple flame, and this is the colour of the north-light; now this flame must be the æther igneus. Upon the re-admission of the circumambient air, especially if thick and damp, the acid or æthereal fire within is expelled, and hovers for some time on the upper surface of the glass, till, mingling with the air, it is dissipated, and extinguished. Now this seems to intimate to us, that the north-light observed towards the pole or axis of our earth, does not only owe its origin to the æther, but is the very æther itself; which, being aggregated, gives way to the

the impresson of the humid air, and mounts and floats above the clouds, whose motion likewise renders it variable. Whilst the air is dry, whether by the frosts of winter, or the heats of summer, no north-light is to be seen. But upon the weather's beginning to break, either by a thaw after a sharp frost, or by rains after heat, and when these are preceded by damp exhalations, the north-light breaks forth, as a certain prognostic of the change. For these exhalations have then nearly the same effect in the atmosphere, as the aforementioned intrusion of the air into the glass-globe; propelling upwards the lighter æthereal air, when for a time it appears like the purple coloured fluid issuing from the glass-globe, till it is dissipated, or mixed again with the ambient air. It is further observable, that the air near the poles is far more dense, and compresses more vehemently, as being repelled with less violence, than that in the middle of the globe, where the centrifugal power operates with a more direct and immediate force *.

Should this hypothesis, as indeed I know of no better, be approved by superior naturalists, it will afford a very ready solution of a difficulty, which clogs all other systems; namely, It is well known among those people of the north, who have the best opportunities of observing these lights in the air, that the general region of them is not due north, but rather in the north-west quarter of the sky. Is it asked how this comes to pass? it may be answered, that as the ignorant imagine the sun daily to run from east to west, the more intelligent know, that, on the contrary, the earth daily revolves from west to east; thereby on one side a rarefaction may be caused in the air, and on the other a condensation. It is likewise observable and consonant to this, that from sun-set to a little past midnight, the Aurora borealis is strongest, and to the best of my knowlege not towards the morning. Let others who have more sagacity, investigate this matter farther.

I must ask the reader's pardon for dwelling so long on this particular, though I am not without apology, since it appertains

* In locis polaribus vis centrifuga nihil de gravitate aeris tollit, cum in eam sub Æquatore directione perpendiculari agat. Quamobrem pondus atmospheræ supra æquatorem debet apparere minimum, prope polos maximum; quemadmodum observationes baroscopicae quoque evincunt. Petr. van Muschenbroek, *Elementa Physicæ*, Sect. 1116.

to the phenomena of Norway, and of the north in general, and these are more immediately my subject, than natural philosophy in general; which, however, I flatter myself, may, in some respects derive some benefit from this work.

I cannot forbear adding, that the northern peasant, tho' he does not arrogantly pretend to inform us, what the *Aurora borealis* is, yet he is not so stupid as to imagine it to be some tremendous portent of wars, the deaths of princes, and other direful events, which has been the interpretation of those lights, even till modern times, when they have been seen in France, Spain, and Italy, and been made use of to circulate a general terror and anxiety, very seldom as the omen of any happy event. Yet a signal instance of the latter happened even in Norway, and no longer ago than the middle of the last century; which, among other things shews, the north-light formerly not to have been so very usual even here, or not so well known. But one extraordinary circumstance is, that the person who interpreted this light as an omen, was a professor of physics and mathematics, who, in the middle of the last century, was firmly persuaded of having seen an apparition, which probably was no other than the north-light; and this apparition revealed to him the important and happy revolution, which, within three years after happened in this kingdom, when the government was changed into an independent hereditary monarchy *.

* The authority to which I can appeal for this, is in J. H. Feustking's *Gynæceum Hæret. Fanat.* p. m. 658 in these words: "A few years since died here in Kemberg, in his 92d year, our learned and experienced physician Ambrose Rhodes, who, whilst professor of natural philosophy and mathematics, at Christiana in Norway, predicted from the appearances which were observed at Eger in Norway on the 1st of August, 1657, that Frederic III. who was then on the throne of Denmark, would be invested with an unlimited sovereignty, and that the kingdom before elective, would be thus made hereditary. An account of his thoughts and inferences from this phænomenon, he drew up in writing at the pressing request of Jens Bilkens, chancellor of the kingdom. I must own that some particulars in it are very astonishing, and appear so even to the celebrated C. S. Schurtzfleisch, who in his Latin letters (which are very well worth reading) mentions it in the following manner. "Memorable est in vicino oppido Kembergenfi, medici et mathematici non inglorii judicium de ostento quodam in Norvegia viso, unde præfagivit Regi Daniæ Friderico III. plenam et hæreditariam potestatem, quod eventus An. 1660, approbavit."

S E C T. IV.

From the light, which is the first object of perception in the air, I proceed to its heat and cold. The degrees of these, as already observed, are very various; and this not only from the annual vicissitudes of the seasons, but in the very same season, and on the same day, the variableness is greater than strangers can well conceive to be possible. I shall the rather enlarge on this remarkable phenomenon, as it is a manifest argument of the power and wisdom of the Creator, and his tender care of his creatures *. On the east-side of Norway, or from the frontiers of Sweden to Filefield, that is in most of the provinces, the winter's cold generally sets in about the middle of October, lasting till the middle of April, or, according to the computation of the peasants, from Calixtus's day to that of Tiburtus, when the air is here as cold as at the extremity of the temperate zone. The waters are frozen to a thick ice, and the mountains and valleys covered with snow. I shall hereafter produce some instances of the extreme intenseness of the cold. However, this is of such importance to the welfare of the country, that, in a mild winter, the peasants, who live among the mountains, are considerable sufferers; for, without this severe frost and snow, they can neither convey the timber they have felled, to the river, nor carry their corn, butter, firs, and other commodities, in their sledges, to market-towns, and after the sale of them, carry back the necessaries they are there supplied with. I must here mention a wonderful instance of the divine œconomy, which I should hesitate to commit to writing, did not thousands of witnesses confirm it: when the

The winter mild in the western parts, and the frost seldom severe or lasting.

* According to the common opinion, and even the position of Ptolemy's Geogr. cap. viii. countries equally distant from, or equally near to, the line, should have equal cold and heat. But that this is not the case is proved by Professor Kaestner in his Explanation of Dr. Halley's method of calculating heat, Hamburg Magazine, tom. iii. p. 426; but none of the instances adduced by him are so clear as what might have been brought from the natural state of Norway, had he been acquainted with it. The true cause of the want of heat, in the northern countries, is the vicinity of that part of the globe to the pole; the solar rays there falling more obliquely and, consequently, not acting with such force as near the line, where they fall in more perpendicular directions. The other cause, most current among the ignorant, namely, the greater distance of the sun, can occasion no great difference, if we consider the vast distance of the sun from the earth, consisting of so many millions of miles; for this being considered two hundred miles, more or less, cannot be supposed to affect us, at least not in any degree; especially as we know, that the sun is farthest from the earth in the height of summer, and nearest it about Christmas; but it then descends so very low, that, from the obliquity of its rays, it gives little or no heat.

winter rages with such severity in the east parts of Norway, that all the fresh-waters are frozen, the lakes and bays are open on the west-side, though lying in a direct line with the eastern parts; the air is misty and cloudy, and the frosts seldom are known to last a fortnight or three weeks. In the center of Germany, which is two hundred leagues nearer the line, the winters are, generally, more severe, and the frosts sharper than in the diocese of Bergen, where the inhabitants often wonder to read in the public papers, of frost and snow in Poland and Germany, at a time when no such weather is felt here. The harbours of Amsterdam, Hamburg, Copenhagen, and Lübeck, are frozen ten times oftener than ours; for, with us, it is generally known not to happen above two or three times in a whole century; and, which is yet more extraordinary, when the harbour of Bergen is frozen, the Seine, at Paris, may be concluded to be in the same condition. Thus our winter at Bergen is so very moderate, that the seas are always open to the fishermen and mariners; and it is seldom that the bays and creeks are froze over, except those that reach far up the country towards Filefield, where they meet with keen and dry north-east winds, blowing from the land *. In the other parts, towards the western coast, it is but seldom, as has been before noticed, that any hard winters, or lasting frosts, are heard of, though travellers, who perhaps come from, or beyond, Filefield, about 20 miles eastward, say, they have had severe winters there for some time past.

S E C T. V.

The wise and
bountiful de-
sign of provi-
dence in this.

This amazing difference is, according to the wise design of the creator, requisite for the well-being of the country; for, as I have already observed, the eastern parts require a hard winter for their subsistence, and a mild winter, and open weather is no less necessary to the western parts, where the inhabitants chiefly main-

* As far as the 80th, or 82d degree, the north-sea continues open and navigable both winter and summer, except in the creeks, and along the shore, in Finmark, Iceland, and Greenland, from whence the large masses of ice being detached, are seen to float in the sea. In winters of extraordinary severity, when the Baltic is frozen up, the swans, which otherwise are not to be classed among the birds of this country, transmigrate hither, to procure themselves water, which they are there deprived of; and I have been credibly informed, that the few swans, which are still to be seen at Syndfiord, and other places within my diocese, were refugees from Denmark, in the years 1708 and 1740.

tain themselves by their sea-fisheries. It is expedient for them, that the sea should be open during the whole winter; for from the middle of January, the herrings, skates, cods, &c. are chased by the whales towards the coast, when the peasants fall out in multitudes from the creeks, into the sea, and thus get a great part of their subsistence for the whole year; and several thousands of the northern peasants of both sexes, during January and February, pass the whole day upon the open sea, and only towards the approach of night betake themselves to their huts, in the neighbouring islands. This mildness of the winter is likewise necessary for curing and salting the fish, which in frosty weather would be spoiled and useless: for if the fish should freeze as soon as taken out of the water, the salt could not penetrate into them, being obstructed by the ice; and if carried home and kept till a thaw comes on, they soon become flaccid and putrified at the bone, and consequently unfit for use; a sufficient evidence of the absolute necessity, and great benefit of a mild winter, to the western parts of Norway.

Winter-
fishery.

S E C T. VI.

If it be farther asked, how is it possible that nature can regulate herself by the necessities of the inhabitants, and give them frosts and thaws at the same time, under the same climate; I answer, that it is no miracle, but purely the result of the primary natural disposition of things. It is a general rule, that Norway, from its situation on the globe, must have severe winters; but the exception from this rule lies here; the western side of Norway lying nearest to the great ocean, its air must be sensibly milder, the intense frost being warded off by the constant intermixture of warm exhalations, vapours, and mists from the sea, which in the lower region of the air, insensibly dissolve the almost imperceptible sharp particles of ice that proceed from the north pole, or congeal in the cold upper regions of the air, but are melted as soon as they fall in with the warm vapours of the sea. That these exhalations abate the natural rigour of the weather, cannot be doubted; but whether they arise from warm springs at the bottom of the sea, continually boiling by means of the central fire; or if this be denied, whether this ebullition be the effect of lesser subterraneous

The natural
cause thereof.

vulcanoes resembling the mountainous ones on the surface of the earth, it would not be pertinent here to determine.

Woodward's
Theory of the
earth, p. 39,
and 52.

Without entering into a prolix examination of these things, I shall only quote Woodward's opinion on this head, "There is a nearly uniform and constant heat disseminated throughout the body of the earth, and especially the interior parts of it; the bottoms of the deeper mines being very sultry, and the stones and ores there very sensibly hot, even in winter and the colder seasons; and 'tis this heat which evaporates and elevates the water of the abyfs, buoying it up indifferently on every side, and towards all parts of the globe." And, page 151, he adds, "That the water resident in the abyfs, is, in all parts of it, endued with a considerable quantity of heat; and more especially in those parts where these extraordinary aggregations of his fire happen. So likewise is the water which is thus forced out of it, insomuch that when thrown forth and mixed with the waters of wells, of springs, of rivers, and of the sea, it renders them very sensibly hot." Thus far Woodward.

It is sufficient that experience shews the countries remote from the sea, tho' nearest to the line, to be subject to the hardest winters; and that among those countries which are actually encompassed by the sea, none have less of the winter, that is of the frost, ice, and snow thereof, than those which lie open to the great sea, or the main ocean, the mild and warm effects of its exhalations being mostly felt in winter, when they are most copious, having a large range in the atmosphere, which at that season is less crowded by the solar rays. It is almost inconceivable, tho' certainly true, that the winter of the year 1708, so remarkable for its destructive severity, was not remarkably different at Bergen from the other common winters. And so likewise Ireland, Scotland, and the Orkneys, all situated towards the western ocean, felt little of the extraordinary rigor of that winter; of which more particular accounts may be read in the English philosophical

* To remove all doubts, which those who are not experimentally acquainted with this singular providence may entertain of it, I shall confirm it by the following passage from Derham's physico-theology, B. 4, C. 2. Of which defence against the most severe cold, (namely the warm exhalations from the sea,) we have lately had a convincing proof in 1708, when England, Germany, France and Denmark, and even the more southerly parts of Italy, Switzerland, and other countries, suffered severely; whereas

lofophical tranfactions * N° 324. In relation to this truth, a certain French geographer muft be allowed to be in fome meafure right, though the affertion feems very fingular and unheard of, “ *L’air eft fort doux en Norvegue, de forte que la mer n’y gele point, et la neige y eft fort peu de tems.*” i. e. In Norway the air is very temperate, fo that the fea is never frozen, nor does the fnow lie long upon the ground.

Les Etats, Empires et Princip. du Monde, par Sieur D. T. V. x. p. 777.

S E C T. VII.

The aforefaid writer probably had his account from fome Norwegian, who was acquainted only with the weft fide of the country; for the description by no means agrees with moft of the provinces, and efpecially all the eastern parts near Filefield. The intenfenefs of the winter is there extreme, particularly in the levels on the mountains; which are far more expofed to the feverity of the air than the valleys, and reach towards the upper region of the atmofphere which is much colder than the lower, as the reflexion of the fun is there lefs powerful, and the air more rarified. The ufual degree of the cold, efpecially in January and February, may be fufficiently conceived from hence, that the largeft rivers, with their roaring cataracts, are arrefted in their courfe by the froft, and the very fpittle is no fooner out of the mouth, than it is congealed, and rolls along the ground like hail. A farther inftance of the extreme cold, not unworthy notice, efpecially as it raifes aftonifhment in foreigners, is, that no fooner has a horfe dropped his excrements on the ice, than the balls of horfe-dung move and leap on the ground: The caufe of this is the fudden change from heat to cold, which occasions a violent conflict, when the fharp and denfe air penetrates forcibly into the lighter, and expels it *.

The cold moft fevere in the eastern parts.

It

whereas Ireland and Scotland felt very little of it, more than in other winters. But it feems this is what ordinarily befall thofe northern parts, particularly the iflands of Orkney, of which the learned Dr. Wallis gives the following account, “ there the winters are generally more fubject to rain than fnow; nor doth the froft and fnow continue there fo long as in other parts of Scotland; but the wind in the mean time will often blow very boifteroufly, and it rains fometimes, not by drops, but by fpouts of water, as if whole clouds fell down at once, &c.” Likewise M. Lucas Debes, in his description of the Ferro iflands, affirms, “ that the winters there are not very cold, though they lie in the 62d degree of latitude; the frofts feldom lafting longer than a month, and are withal fo moderate, that no ice is ever feen in an open bay, nor are the fheep and oxen ever brought under cover.

* Of the fmall and piercing darts of ice, as they are called, which are particularly fhut forth by the north, and north-eaft winds, the very learned Jens Spidberg, deaf

on

It is necessary to use great caution in providing against such weather, in which an unexperienced or unguarded traveller may be deprived of his nose and ears; it is particularly expedient to cover the face, and for this the most approved method is to fix a piece of gauze under the hat; which both retains the warm effluvia issuing from the body, and keeps off the piercing air better than would be imagined; allowing at the same time sight enough, to guide the horse. Some now and then rub their faces with a handful of snow, as enabling it, better than by warmth, to bear the cold; but in long journeys over the highest mountains, where the air is much keener, and the winter quite insupportable, no precautions would avail, without the convenience of the mountain-Stoves, as they are called, which are kept at the public charge for the repose and warmth of travellers. Of the necessity of these, and the impracticableness of the mountainous and desert parts in the winter-months, the Swedes afford a melancholy instance; and as the like is scarce to be found in the history of any age, I shall here give a short account of it. In February 1715, seven thousand, some say nine thousand Swedish soldiers, together with their officers, perished in a most deplorable manner on the mountain of Ruden, or Tydal, which separates Jemteland in Sweden, from the Diocese of Drontheim, without any other enemy than the extreme cold; which surprised them on the ridge of that mountain, where nobody could come to their assistance. The affair happened in this manner:

Several thousand Swedes perish in the frost.

In the autumn of the preceding year, this corps, which then consisted of ten thousand men, had penetrated into the country, and appeared to have a design upon Drontheim; thereby to clear a passage for the main army, which was at that time under the command of the king in person, and had made an irruption near Frederickshall, and to facilitate its farther progress into

of Christianland, bears the following testimony, "It cannot be denied, that the air towards the north is in winter-time full of innumerable particles of snow and ice, which are frequently so large and sensible, that when the wind blows fresh, they dart into the face, and give it a pain like the smart of a switch; and they are not only felt, but when the cold is very intense, and the sun shines clear, these particles may be visibly discerned, glittering like so many little Stars." And this accounts, why the north wind is of a more penetrating coldness than any other, that in its passage, it sweeps along the snowy mountains of the north, and thus becomes impregnated, as it were, and loaded with these particles, or lamellæ niveæ et glaciales, which among us occasion such a sharp cold. Supplem. II. Act. Vratisl. Art. 4. p. 71.

Nor-

Norway, but the gallant Danish general Budde, who, in the last invasion of the Swedes, had done his country great service, made such good dispositions against the enemy, that they laid aside their design of attempting Drontheim, and cantoned themselves among the peasants, till the beginning of the year 1719; when, though late, they received an account by express of the unexpected death of the king before Frederickshall. Soon after, advice coming that Count Sponeck was in full march towards them, they had orders to make the most precipitate retreat over those desert and lofty mountains; but just as they had reached the frontiers of their own country, they were overtaken by a storm, accompanied with an extreme cold, and much snow, which so bewildered them, that the greatest part of them perished. A company of two hundred Norwegian sledge-men, under major Emahus, which followed them close to observe their retreat, found the enemy dead upon the mountains; some sitting, some lying, and some in a posture of prayer, all frozen to death. How great their distress must have been, may be judged from their cutting their muskets to pieces, in order to burn what little fuel they could raise from them. The generals Labarre and Zoega were among the dead, but the generals Adlerfeld and Horn barely escaped with their lives; and of the whole body only two thousand five hundred, or, according to others, no more than five hundred, survived this dreadful catastrophe*.

S E C T. VIII.

From this accidental digression I now return to the cold in Norway, which led me into it, and shall shew, according to my design, that the wise and provident Creator has not left the inhabitants of these cold climates without a greater variety of preservatives against the weather, and more means of keeping themselves warm, than other countries afford. 1. The country abounds in large forests, affording them plenty of fuel, and timber for building strong houses: 2. The wool of the sheep, and the furs and

Preservatives
against the
cold.

* Whoever considers this great loss, which was inflicted by the hand of God, and the many other defeats, particularly at Moss, Frederickshall, Ringerige, Crogstoven, Iid, and elsewhere, cannot but wonder that Mr. Nordberg, an historian of great merit in other respects, should in the second part of his life of Charles XII. affirm, that the war was carried on with equal advantage, or rather on the Swedish side with considerable superiority. "Par là les forces de Charles XII. furent assez égales à celles de son ennemi. Il fit trois campagnes en Norvegue avec un avantage assez égal et même avec supériorité." An assertion without the least truth. But the circumstances of this last war were never rightly understood by foreigners.

skins of wild beasts, furnish them with warm linings for their clothes, and good bed-covering: 3. The innumerable flights of wild fowls supply them with down and feathers: 4. The mountains themselves serve them for fences, and retreats; their summits, indeed, are uninhabitable, on account of the cold and barrenness; but the shelving sides, or interstices, especially where the exposure does not face the north or east, enjoy weather that is at least supportable. But above all it is to be observed, that even the cold air occasions warmth in the bodies of men; its compressive force rendering the body more firm and compact, and fortifying it against external injuries: and thus the natural warmth is by the closeness of the pores repelled towards the inner vital parts, and more particularly concentrated in the stomach; so that the northern people are known to digest smoked flesh, dried fish, and other food hard of digestion, better than any other nations*. In short, in this as in every other respect, the œconomy of the Almighty towards his creatures is full of wisdom, goodness, and harmony. I can even venture to affirm, that were the Norwegians tempted by any thing to change countries with the Italians, the winter's cold would not be the motive to the exchange: for this is the least of their complaints; and, for my own part, I cannot say that the cold here has ever been more painful to me than in other parts.

S E C T. IX.

Great heat in
summer, and
its causes,

After this account of the cold in Norway, it is proper to speak of the heat. Here I apprehend many would interrupt me with a question, whether it is ever actually warm in Norway? I answer from experience in the affirmative: for in the best summer-months it is not only warm, but sometimes to such a degree, that according to the vulgar phrase, *it may make a raven gape*; and persons, who have been born and educated in hot climates, might fancy themselves suddenly transported home. Particularly in this present year 1750, on the last day of July and first of August, the

* That the particles of the atmosphere are more condensed near the poles, and consequently press more forcibly on bodies, than in the expanded and rarified air of hot climates, inasmuch that 1010 pounds of copper at Drontheim, weigh only 1000lb. at Rouen, is demonstrated and explained by J. Rohault, *Traité de Physique*, Tom. II. P. III. C. III. § 9. where he also shews, that the mercury rises higher in Denmark and Sweden, than in France and Italy.

heat was so excessive, that M. Haar, minister of Waas, and formerly chaplain in the East Indies, declared he hardly ever felt it hotter in that country; tho' I am inclined, partly, to impute this, to the much stronger impression made on the mind by present sensations, than by the recollection of any past*.

The cause of these violent heats (which however are but of short duration) may be partly derived from the valleys inclosed within high mountains, where the rays being compressed and confined, the reverberation of them from all sides must occasion such heats, as were the summer of any considerable length, would bring grapes, and other fruits and vegetables, to the like exquisite perfection as in other countries. The second, and which is the chief cause, is, that in the midst of summer, the sun's absence below the horizon, is so short that there is no night, at least no total darkness; consequently neither the atmosphere nor the mountains have time to cool, but often retain part of the heat of the preceding day; and if the general opinion of naturalists, that a mineral soil emits sulphureous and hot effluvia, be true, this may come in for a third cause of the heat, the country being almost every where full of mines.

There cannot be a more decisive proof of the summer's heat Early harvest. in Norway, than that several vegetables, and particularly barley, grows up and ripen within six weeks or two months; which, besides the great profit, is of very considerable advantage to the peasant, as it enables him to begin threshing when he will, which he is often under a necessity of doing very early. It is said, that the same happens in Sweden within a much shorter space, namely, 36 days; but this I mention only on the authority of the celebrated Olaus Magnus, who has the following passage concerning it, "*Quoad Aquilonares hoc certum est, in plerisque agris Westrogothorum, parte objecta meridionali plagæ, hordeum spatio 36 dierum a semine projecto maturum colligi; hoc est, a fine Junii ad medium Augusti, aliquando celerius*"†. It is certain that, where nature has but a short time to work, she accelerates her opera-

* It appears, that in the countries lying far north, the great length of the days often renders it warmer than with us. *Wolffius's Physic. Part. II. Chap. VIII. p. m. 180.*

† On my visitation in the year 1750, I saw at Indwigen, in Nordfjord, barley ripe and mowed on the 29th of July. Of the vegetables of the country I shall hereafter speak more at large.

tions,

tions, and acts with greater energy. In our northern gardens, it is indeed seldom that the winter fruits can attain to their proper maturity; but those of the summer keep pace with those of Denmark, where strawberries, cherries, and the like, are ripe so early as the first of July. Counsellor Carbiner has more than once had ripe figs, in his garden at Bergen; and in Christiana, M. Wilster, an apothecary, has several years brought grapes to a degree very little short of perfect maturity.

S E C T. X.

False notions
of foreigners
concerning
the air in
Norway.

From these instances, I presume, foreigners will have the candor to admit, that however natural and lasting the cold may be in Norway, yet the impartial Sovereign of nature has not so far neglected us, but that we may pass our days agreeably; especially, if it be considered, that what the climate of Norway denies, it abundantly compensates in other advantages; of which I shall hereafter have occasion to adduce several proofs, partly in praise of the Creator, and partly for the information of foreigners, and the confutation of that very false idea, which, even in my own country, men entertain of the rigorous and unpleasant climate of Norway; which is seldom mentioned but with a commiseration, of which it is not a pressing object. But no conceit is more absurd than that of Simon Patrick, a native of England, and in other respects a writer of great learning and worth; who represents a Norwegian as one who had never seen a rose (which is a very common flower in Norway) and was afraid to touch it, imagining it to be fire *. Who would have thought, that an European could be such a stranger to Norway, and an Englishman too, who ought to know it better from the equality of its situation with the North of Scotland, this being nearly in the same degree of latitude with the bishopric of Bergen; not to mention the frequent

* This passage occurs in a piece of his, in which he instructs and cautions a friend against lukewarmness and apostasy from the Christian religion. His words are to the following import: "The poor Norwegian, as history informs us (I ask what history?) was afraid at the first sight of a rose to touch it, being apprehensive of burning his fingers; he was astonished that trees, as he imagined, should produce flames and fiery flowers; he moved his hand towards it to warm himself, but could not be prevailed with to touch it; but as he was over-joyed to be delivered from such a gross mistake, being afterwards brought not only to touch but to smell this innocent flower, which at first appeared to him to be a fire, so it will be with us, &c." And just so would it have been with the worthy author, had it been his fate to have come to Norway, and there to have seen the roses growing every where.

voyages of the English to Norway, some of whom are very well pleased to settle there; or the constant voyages of Norwegians to England, who, if the trade would turn to any account, might furnish the English abundantly with rose-water.

S E C T. XI.

If the air of Norway be considered in respect to health and sickness, particularly as to the natives, it will appear to be pure and salubrious from many instances of persons of a very advanced age, especially among the peasants. Mr. Jonas Ramus, in his Chorographical Description of Norway, is of opinion that a more healthy air in summer is hardly to be met with any where than in Norway; though I must confess, that this varies according to the situation of places. The most pure and kindly air, I judge to be, in the middle of the country, especially about the mountains, where the inhabitants have hardly an idea of sickness, unless it be hereditary, or contracted by intemperance. It is reported, though I will not warrant the truth of it, that in the vale of Guldbrand, which is regularly visited by very salubrious gales, especially in the parish of Læssøe, there are persons of such an extreme age, that from a lassitude of longer life, they get themselves removed elsewhere in order to die the sooner; that farther in the province of Valdres, and in other parts, meal may be kept many years without being worm-eaten, or any other damage; which amounts to a demonstration of the purity, wholesomeness, and dryness of the air. But on the other hand, on the sea-coasts, and here in Bergen, I account the air to be less healthy from the abundance of humid and saline vapours from the sea, especially in winter, when the mists and rain are more frequent than clear frost; yet with the asthmatic, this moist air agrees better than a finer or drier, which may be more piercing; a proof of this I had in an intimate acquaintance of mine, who found his breast and lungs considerably eased after his arrival from Denmark, which I attribute to the air here, as more humid than that of Copenhagen, tho' the latter in winter is not without frequent fogs and rains*.

Quality of the
air in respect
to health and
sickness.

* This may possibly be the cause that a very dry air hurts consumptive persons, by too strong a tension of their weak lungs, and by detaching and carrying off too

Generally speaking, experience, the best instructor, shews the air in most places of Norway to be pure and salubrious, and even more so than in many other countries, as persons of regular lives, all circumstances duly considered, arrive in these parts to the utmost extent of the age of man. I shall produce many memorable instances of this hereafter, when I shall particularly treat of the inhabitants of the country; and the same is evident from the yearly bills of births and burials, which, by his majesty's order, I transmit to Copenhagen. I shall here only mention, that next to their plain and simple food, the Norwegians owe their permanent health and longevity more to their air, than to medicinal arts and precautions; for medicine is very little understood here; the little we know of it is learnt from foreigners; and whilst the lawyers are never at a loss for clients, practitioners in physic meet with very few patients.

It is only in the chief towns that physicians are commonly to be found, and there they are established with a public salary, as Provincial physicians, and in general have but very little employment; even in this populous city of Bergen, among thirty thousand souls, (some indeed carry the number higher, but I believe they are mistaken) there is but one, or at the most two physicians, and these are found sufficient; whereas in a German city of the same extent, such as Lubeck, or Rostock, ten or more may find an ample support. Norway, indeed, cannot be said to be entirely exempt from pestilential distempers, for the Black-death, known all over Europe by its terrible ravages, from the years 1348 to 50, was felt here as in other parts, and to the great diminution of the number of the inhabitants. I likewise find accounts of great numbers of people of all ranks, swept away in the years 1618, 1630, and 1654. But the piercing colds of winter, and the storms seem to be a divine disposition for purifying the air, and stopping the progress of an epidemical disease. The like good effect is produced by thunder and lightning, which dissipate the sulphureous and nitrous particles in the air. It is a general notion, that storms and tempests are more violent here than else-

much of the inward moisture. The most robust persons suffer sometimes by this extreme ficcity of the air. The people of the eastern coast of the Red-sea are sometimes obliged to sprinkle water up the air to moisten it, and when they breath, hold a wet cloth to their mouths. Hamburg Magazine, B. II. page 38.

where,

where, but in this I am inclined to think the sound imposes on our judgment, the noise and eccho of winds and thunder being much louder among the lofty mountains than in the plain country. This difference I have found, that sometimes, tho' seldom, thunder is heard at Bergen in the winter, doubtless because that season of the year is, as hath been already shewn, attended with very little pure cold, but rather with a raw air, and of course with more rain than snow and hail.

S E C T. XII.

As to the humidity of the air, rains being so unusually frequent at Bergen, and for some miles round, as to be proverbial among the Dutch; I apprehend the cause may be derived not only from the high mountains, there being in other parts of this diocese much higher mountains, with much less rain, but rather from the many narrow valleys and creeks in the neighbourhood, which become soon filled with their own evaporations as well as those from the sea, and these are not soon dispelled by the wind or sunshine, except in the heat of summer, when the sun has sufficient power to draw them up into the open air above the summits of the mountains, there to be separated and dispelled by the wind. Whereas, on the contrary, in other seasons of the year, when the power of the solar rays is weakened, the vapours cannot rise to any considerable height above the horizon*. Hence we see them hover like rain-clouds, and rest not only on the tops of the mountains, but often hang about their sides, insomuch, that the top may be clear, and the middle of the declivity be covered with these rain-clouds: and when travellers or peasants happen to be surprized among them, which is a common case, their sight is so obstructed, as not to see their way; they breath with difficulty, grow wet and cold, and un-

Rains and
damps on the
west-side.

See a view of
Bergen, fig. 1.

* If the old opinion, of the sun's exhaling the vapours upwards, should not prevail against the new, which holds, that small vesicles of air are impelled upwards, and being lighter than the lower air, float in it. Wolff's Physic. Cap. v. Sect. 247. Yet my conjecture on the rain at Bergen still keeps its ground; for the eminent naturalist just cited, allows that the winter-vapours are heavier, and as such sink lower into the atmosphere, or cannot ascend so high, the teguments of their small vesicles being then condensed, so that the effect produced is the same. His words are, Sect. 254, "The vapours being rarified in the heat of summer, they then rise to a great height in the air:" Again, "the grosser vapours, having a thick tegument and a small cavity, are heavier, and remain in the lower region of the air, this being of a more dense nature than the upper; thus in winter, the vapours being condensed by the cold during that season, remain in the lower parts of the atmosphere.

less they speedily reach the open air their health is endangered. These rain-clouds are like sponges swelled with water, and on any pressure, or when driven against the mountains, discharge their waters in heavy rains, and cause that constant humidity*. On this account, indeed, Bergen is not so pleasant to live in as several other places in Norway are; and the women, who seldom have the use of coaches, are in all weathers obliged to wear a woollen or filken black veil over their heads, whilst the men secure themselves from the rain by rain-hats, made like umbrellas.

S E C T. XIII.

The wise disposition of Providence in this.

As one of my chief views in this work is, according to my shallow knowledge and insight into the harmony of things, to shew that all the works of God are full of loving kindness, I must here observe that the moist and rainy weather, which prevails all over the western coast of Norway, but chiefly about Bergen, is excellently adapted to the necessities of the country, and in several respects contributes to its welfare. First, it is of great benefit to the countryman in his corn and hay-harvest, for the thin surface of earth on the high rocky mountains, which line the western coast, requires a great deal of moisture, otherwise it would not yield even grass, and much less would it produce corn; it would literally answer to the parable of the seed, *which fell on a rock and withered away, because it lacked*

* Edward Dapper, in his voyage to Africa, page 56—58, thus accounts for the heavy rains in Ethiopia, which cause the famous inundations of the Nile, “the sun-beams, says he, exhale the vapours; afterwards the middle air, which is cold, and adheres to the cold summits of the mountains, dissipates the clouds which the north-wind has aggregated, or discharges them in rain.” What this writer attributes solely to the north-wind, professor Kraft, on better grounds, judges to be an effect of that attraction which is most discernible on high mountains, but in some measure affects the whole globe, which revolving like a wheel, has an attractive power: His words are these, “I have often observed in fair weather the high mountains to be covered with a thick cloud, as soon as there is the least haziness in the air, and from hence it is that in mountainous countries, the rains are both more frequent and more violent, than in a champain country.” The single cause of this, is, the attraction of the mountains, for the attractive power of large mountains, may in some measure be proportionate to the attractive power of the earth; therefore when neither of these attractions are impeded in their operations, and the proportion is adjusted, the direction in which a particle floating in the air moves towards the mountain may be determined. This is proved from the ingenious observation made by Mess. Bouger and de la Condamine, on a mountain called Chimborazo, in Peru, when their plummet was by the mountain drawn aside from its perpendicular direction. The springs found on the tops of mountains are produced by this attraction; and as many particles of matter as are seen in connection, so many instances are there of this attractive power. Reflections on the Newtonian and Cartesian Systems, by professor Kraft, in Actis Soc. Hafnienf. Tom. III. p. 284. sq.

moisture. Thus these deficiencies, in respect to vegetation, are supplied by the rain which continually moistens the little earth we have. Indeed, in most places, the rain would not be sufficient without the masses of snow on the tops of the mountains, or when these are wanting, the many pieces of standing-water on their ridges, which sometimes by subterraneous ooings, sometimes by gentle streams, thoroughly water the earth, and afford a constant refreshment to the parched sides of the mountains. Whereas, in the vale of Guldbrand, and other parts where the rains are not so frequent, and the mountains not so steep or thick set as here, the water is conveyed into the fields by trenches, and thrown upon the cultivated ground with shovels, as is practised in Persia, and other hot countries. A second benefit of this wet and rainy weather, especially when calm withal, and chiefly in spring, is, that it gives fishermen the advantage of larger draughts; for in clear and open weather the herrings, skates, &c. which are every year taken here, and in Nordland, to the amount of many tuns of gold, are generally shy of venturing near the shore, and into the bays, but in rainy or hazy weather, the fishermen meet with numberless shoals of them.

S E C T. XIV.

In the preceding articles, I have shewn the diversities of the northern air, in respect to cold and heat, frost and thaws, both in those provinces which are equidistant from the line, and in the east and west parts of the country, and it is the same in respect to fogs and rains. Filefield usually makes a very remarkable difference betwixt us and our nearest eastern neighbours, in the province of Valder, insomuch that when it is foul weather with them, with us it is fair, and so vice versa. The course of the air, when impelled against the highest mountains, is checked, for it seldom ascends to pass over them. Of this I was an eye-witness in my return from Christiania in 1749, when travelling on the 24th of June over the highest part of those mountains, I observed thick rain-clouds hanging over Valdres, which we had left, and where it had been rainy for several days; upon the hill we had a little fleet, but in the valley of Laerdale, where we arrived at our descent from the mountain, the weather was

Diversity of
weather in
parts contiguous
to each
other.

PART I.

I

warm

warm and dry, and had been so for a considerable time before. But this case is common to Norway, with other mountainous countries, which I shall here take occasion to illustrate by some parallel instances: We are informed *, that whilst the summer season lasts, from cape Comarin to the coast of Coromandel, it is winter during that time, from Diu to the aforesaid cape. In like manner, on one side of the mountain called Gates, or Ballagates, the fields are cloathed in their verdure, and the country appears in all the gaiety and luxuriancy of summer; whilst, on the other, it is covered with fogs and rain. Something similar to this is also observed from Ormus to Cape Rosalgate, where the ships may harbour and enjoy the most delightful weather imaginable, whereas beyond the cape they meet with hard gales, rain, &c. A further account of these remarkable particulars the reader may meet with in Paul van Caarden's voyage to the East Indies.

S E C T. XV.

Deep snows
on the moun-
tains; their
advantages
and detri-
ment.

From the consideration of the rain, I am naturally led to speak of the snow, especially as both are the same in substance, differing only in texture and figure, which depend on the warmth or coldness of the air, as I myself experienced in coming down a mountain, where, till about half way, we had snow, but a little lower the flakes of snow were melted into drops of rain. Now in Bergen these snows seldom lie long; for it must be a very extraordinary winter, when the sledges are used a fortnight successively; whereas in the other northern provinces the snows are very thick and lasting, and lie long; and on the summits of the mountains, or in the cavities far north, which are inaccessible to the sun-beams, the snow lies throughout the whole year; and the contrast betwixt the lively verdure of the fields and the glistering whiteness of the mountains is not disagreeable. The upper region of the air, (where the atmosphere being thinner than near the earth, the sun-beams are less intercepted and reverberated) is always extremely cold, even in the warmest countries. This is the case in Switzerland and Italy, and even in Persia, according to Taver-

* Concerning this I refer the reader to the northern voyages with Mr. Robert Boyle's Instructions for travelling with advantage, where we find the above observations on the difference of the air in hot countries at a small distance from each other.

nier; and in Ethiopia, according to Ludolph and others, the tops of the mountains, as here in Norway, are covered with snow both in winter and summer. In some places far north the undermost lays of snows, by long lying, turn to a bluish ice, called in our language, *Jisbrede*, which sometimes slides down to a considerable distance over the lower grounds, to the no small detriment of the peasants. In *Justedale*, which lies high among the mountains, one of these *Jisbreds*, detached from an ice-mountain, destroyed some farm-houses and lands, and further damage is yet to be apprehended*.

However, both here, and in other parts, especially in the eastern, the snow is highly beneficial to the peasants, partly in forming a passable road in the winter, without which all traffic and intercourse with the champaign country would be cut off; yet here they are often obliged to put on their *Truviers* † (a kind of snow-shoes, broad and round, made of withies, for keeping the feet from sinking in the snow) and sometimes they must even be put on the horse's hoofs. Another contrivance for travelling on the snow are *skies*, or long and thin pieces of board, and so smooth, that with them the peasants wade through the snow with all the expedition of ships under full sail. In war time a corps of 4 or 600 of these *skie-men* are very serviceable as light troops, for reconnoitring, procuring intelligence, or for any sudden enterprize; no place being inaccessible to them, and they being always sure of coming upon the enemy by surprize. The snow also improves the fertility of the soil, and is supposed in spring, to answer the ends of manuring; it likewise serves for a fence and shelter against severe colds and winds. When the snow is not off the ground early enough in the spring, for the husbandmen to begin the work of that season, they spread over the snow a kind of rich black mould, which, in a few hours, entirely dissolves it. But, on the other hand, the peasants are often sufferers by the snow, which, when it falls in great quantities, and lies

* *Nix jacet et jactam nec sol pluviaeque resolvunt.
Indurat Boreas perpetuamque facit.*

OVID.

† Some entertaining accounts of these *Truviers*, or snow-shoes, which in other parts are also called *Rackets*, are to be seen in *Hennepin*, Tom. II. cap. 27. and in the several histories of the countries and nations of America.

Snow-falls.

long on the ground, destroys thousands of young trees: likewise when it falls late in the spring, and after the trees begin to put out their leaves, which, however, happens very rarely, some trees, and especially the alders, wither and die; a prognostic of which is the leaves turning to a brownish hue. It has been known, and particularly in the year 1742, many people were eye-witnesses of it, that a species of black maggots fell along with the snow, whereby extreme damage was done to the grain and pasture. But among the mischiefs occasioned by snow, the greatest are the Snee-skreed, or Snee-fond, that is, when a mass of snow, falling from a precipice, overwhelms both men and cattle, oversets boats in the lakes*, and, which is but too often the case, demolishes cottages and houses, inasmuch that even whole villages are born down, crushed, and totally destroyed; but this last calamity is rather an effect of the incredible violence of the wind, driving on the masses of snow, when they begin to give way, than of those masses themselves, houses having been seen to fall some seconds before the snow had reached them. These snow-falls are of two kinds; the first, when in frosty weather the light snow is suddenly set in motion, and in its progress scattered over all the country, which the peasants call Meel-fond, and is not attended with such damages as the other, which is known by the name of Kremfond; these happen, when by the mists and rains in spring, the snow, which by moisture is consolidated, falls in a mass, which, tho' slower in its descent, leaves stronger impressions on the sides of the mountains, bearing down every thing in its way, even the strongest new buildings.

A whole parish lost in the snow.

By a snow-fall of the first kind, a whole parish, situate between Quindherret and Hardanger, a century or two ago (for the precise time is not certainly known) was wholly covered, and so re-

* These accidents it seems are not unknown in Switzerland: "Souvent il tombe du haut des montagnes des masses de neige prodigieuses, que les allemands appellent Lawinen et les Romains Avelanches, qui tombant avec impetuosité, font un bruit aussi grand que celui du tonnerre. Non seulement elles enveloppent gens et bêtes, mais elles entraînent et emportent des arbres et des maisons entières. Le poete Claudien qui vivoit au iv siecle, nous apprend qu'on connoissoit deja ces choses de son tems:

— multos hausere profundæ
 Vasta mole nives, cumque ipsis sæpe juvenis
 Naufraga candenti merguntur plaustra Barathro;
 Interdum subitam glacie labente ruinam
 Mons dedit, &c. Delices de la Suisse, Tom. 1. p. 27.

mains

mains to this day; the snow which had thus fallen from the adjacent mountains, not dissolving the year after, was further gradually increased, and hardened by lying, the situation being high, and hemmed in among the mountains. Many lives were lost in this disaster, of which no memorial would remain, were not the truth of the story, which was at first much doubted, still confirmed by several utensils, as scissars, knives, basons, &c. brought to light by a rivulet which runs under the snow; an incontestable evidence that this spot was formerly clear of snow, and inhabited. Such disasters, God be praised, are seldom heard of; and the perpetual snows which always cover the summits of the highest mountains, may, notwithstanding, be justly said to be rather necessary and advantageous, than absolutely detrimental; and thus may be reckoned among the blessings of providence. Experience silences all cavils on this head, the snow being known, by age, to become so firm and indurated, that a horse's shoe makes no impression on it; and as it yields very gradually to the sun, it is thus sparingly dispensed for the daily benefit of the inhabitants beneath, except in a damp southerly wind, which penetrating the snow, the mountains pour down whole torrents. These accumulated snows thus become constant springs for promoting vegetation in the champaign grounds, and when these springs are too early exhausted, the grass and corn inevitably suffer, and are sometimes withered for want of moisture. Another convenience of these currents, and likewise of their impetuous descent, is, that they drive great numbers of little mills, every farm-house* having its own mill. A third advantage of them redounds to the oxen, cows, sheep, and goats, which in summer are turned out upon the mountains for pasture, where they are so extremely tormented with the heat, with gnats and musketoes, that they run about regardless of danger, and in this frenzy many have lost their lives, falling down the precipices; this lays the peasants under a necessity, where no snow is near, of building sheltering places for the cattle; but if any snow-hill be in sight, the cattle move towards

* In the eastern provinces, which are less mountainous, the people not only labour under a great scarcity of water, but in several parts, the mills are at a great distance; but this evil might be remedied, if hanging wheels were used instead of fixed ones; there are but few places where a sufficient water might not be found for those, which require so much less than the others now in use.

it, knowing they shall there be relieved by the coolness, which it communicates to the air. A further remarkable instance of divine goodness in this case is, that just as far as the snow melts, and runs from the mountains, the very best grass is observed to grow, and in the greatest plenty; its warm covering, so far from being an obstruction, both forwarding and improving it. Such are the effects of infinite power, wisdom, and goodness, even where at first sight they are least expected.

S E C T. XVI.

Regular and
irregular
winds.

It will not be improper to subjoin some account of what I have collected in my annual circuits, by my own experience and that of others, relating to the winds in Norway. The winds which most prevail here at Bergen, and all along the western coast, are the south, south-west, and south-east, which last is usually called the Land-South. And in most winters, when on the other side of the mountain called Filefield, the north, the east, and north-east winds usually bring on and continue the hard frosts, they seldom last a fortnight on the north of the mountains called Nordenfield, towards the sea. Here we generally enjoy a southerly wind, which together with the warm vapours, are, as I have already observed, subservient to the provident end of the Creator, in keeping open the sea for the fishermen, and warding off the severity of the winter, of which we have less than they who live in the middle of Germany; altho', in exchange, we have rain and foul weather, which is not so pleasant as a clear frost. It is seldom that the wind here is directly west, it is generally south-west, or south-east, which fills the creeks with the sea-vapours in abundance, which afterwards, floating among the mountains, become rain-clouds. A north, north-west, and especially a north-east wind, are little known here; but when they blow, they verify the words of Solomon, *the north-wind driveth away rain*.

The east winds, which frequently come from the shore, and drive the watry clouds out of the creeks, are besides very temperate, and so are accounted the most salubrious winds, and are the more welcome to us, as usually causing dry weather, but on the contrary, southward, beyond the mountains, they commonly bring rain. The inhabitants of the large province of Nordland, who,
in

in not less than two hundred barks, visit Bergen every year, at the fair and the assizes, and most of whom have upwards of an hundred leagues to sail, are often favoured with the north and south winds, like regular trade-winds, though not so infallibly to be depended on. The wind which is, with the greatest certainty, expected towards harvest, is the north-east, called Hambakke, which name it derives from the melting of the snow at that time from the summits of the mountains; but there is also here, in summer time, and in a clear sky, another kind of a daily trade-wind along the coast, and in the creeks, known by the general appellation of Soelgangs-Veyr, the weather of the sun's course; and in North-land, Soelfar-Vind (the wind of the sun's course) the wind then following the sun. Nic. Hartsoeker attributes this alternative to the sun, which in the morning heats the coast, and consequently rarifies the air, but on its declension in the evening, the air cools, and consequently recovers its gravity, and being thereby become heavier than the sea-air, its own weight carries it thither, and occasions a kind of ebb and flood in the air, the fluid parts whereof undergo the same agitation as water *. A little before noon in the summer time, comes on a west, south-west or north-west breeze, and holds till towards midnight; it is called Hafgul, (sea-cooler) as coming from the sea, and indeed it tempers the heat, which otherwise in the creeks and narrow valleys, would be insupportable. Opposite to this is the Landgul (land-cooler) or easterly breeze, which beginning at midnight, or two hours after, continues till within two hours of noon, when it usually ceases; towards harvest the land-cooler begins to get the ascendant, and the sea-cooler to relax, and then the former is called the Korn-moen, i. e. Corn-mother, bringing a sensible warmth along with it.

Besides these regular winds, the coast is subject to Field-flagers Sudden storms. (mountain squalls) or gusts from the land, by which, without the

* To these vicissitudes of the summer winds, which are in some degree regular, is applicable what Aristotle's disciples write of the Etesiae, which were known in Greece, "Quod ad Etesias attinet, causam harum ajunt esse resolutionem nivium in hyerboreis suppolaris regionis montibus, quæ uti à solis radiis verberatæ atque in exhalationes resolutæ, interdiu ventorum suppeditabant materiam, ita noctu dicta nivium resolutione cum sole quibusdam quasi induciis constitutis, ventos partiter silere cogeant." Athan. Kircherus in mundo subterr. P. I. L. IV. Sect. II. cap. III. p. 196. Likewise Dr. Arbuthnot in his Treatise of the Effects of the Air upon the Human Body: "The winds, when strong, correspond to each other; but, when they relax, they differ, as this proceeds from local causes. It is also clear that the Alpine snows influence the weather in England, as well as that at Zürich."

utmost

utmost precaution a vessel is suddenly lost in the security of fine and calm weather; for these blasts issuing in a narrow and violent current from the clefts of the mountains, or from the vallies, behind a cape, or from the points of the high mountains, and being violently impelled against an opposite mountain, this reverberation causes a kind of hurricane in the air, which, for a time, may deprive the unwary of his sight *.

Hurricanes
and whirl-
winds.

But the real hurricanes, or whirlwinds, which arise, though seldom on the open sea, are known to be extremely dangerous to ships, by their sudden and rapid vortex, which throws the sea at a small distance into such an agitation, that the water in drops flies up into the air like smoke. The common people, from an old superstition, call them *Ganskud*, conceiving that a necromancer, of *Fin-lapland*, has then sent out his *Gansly*, as they call it, to do mischief; but the true cause of the hurricane, is the sudden explosion of a wind confined and agitated in a thick cloud, which being impetuously discharged upon the water, the surface is separated, and rises up into the air like dust or smoke, and hence, amongst us, this hurricane is very properly called *Røeg-flage*, i. e. smoke-squall.

Water-spout.

I shall take this occasion to mention another wonderful phenomenon of the air, which likewise proceeds from dense, and violently agitated clouds, not as any thing new and unknown in the warm climates, but as being, however, somewhat rare, and by experience very well known in the north. I mean the water-spout, or *Trompe de mer*, of which a credible person, who spent his younger years at sea, gave me the following account; that on the wide sea, betwixt *Shetland* and *Norway*, he and his crew, to their great astonishment, observed, in clear weather, and an easy breeze, a cloud gradually descending towards the water, and in the shape of a funnel, or rather a spiral snail-shell, attracting from the surface of the sea a column of water of a considerable diameter; and this suction continued all the time they were in sight. Some hours after came on a very violent rain, which, unquestion-

* Whether it be possible that a man and horse may be carried forward by such a whirlwind, and driven back by another stronger wind meeting him, without any damage to either man or horse, must rest upon the authority of a very credible writer, *Mr. Lucas Debes*, in his *Description of the Island Faro*, p. 97.

ably consisted of the water, which that spiral cloud had a little before exhaled from the sea *.

Filled with astonishment at the many and stupendous works of the Almighty (especially in the air and its phenomena) I close this subject with his own words in the xxxviiith chapter of Job, verse 24, &c. *By what way is the light parted which scattereth the east wind upon the earth? Who hath divided a water-course for the overflowing of waters, or a way for the lightening of thunder? To cause it to rain on the earth where no man is, on the wilderness, wherein is no man? To satisfy the desolate and waste ground, and to cause the bud of the tender herb to spring forth? Hath the rain a father? or who hath begotten the drops, of the dew? out of whose womb came the ice? and the hoary frost of heaven, who hath gendered it?* Conclusion:

CHAPTER II.

Of the soils and mountains of Norway.

SECT. I. Of the soil of Norway in general. SECT. II. Several kinds of soil; as mould, clay, sand, turf, mud, &c. SECT. III. Two kinds of mountains. SECT. IV. Extensive chains of vast mountains, as Koelen, Seveberg, Dofre, and Filefeld. SECT. V. Many lesser mountains in all the provinces. SECT. VI. Deep and long cavities, like secret passages, in some mountains, with conjectures on the origin of them. SECT. VII. Effect of the deluge in dissolving and softening substances, which are at present of the hardest kind, but appear manifestly to have been soft heretofore. SECT. VIII. The origin of mountains, rocks, and smaller stones, deduced from the foregoing argument. SECT. IX. Detriment of so many rocks and mountains to Norway. SECT. X. Advantages of them, according to the wise and bountiful design of the Creator.

SECT. I.

THE diversity which I have shewn in respect to the air, light, heat, cold, rains, and winds of Norway, is no less observable in the various soils of the earth, in the mould, sand,

Of the earth
and soil of
Norway in
general.

* Mr. Lucas Debes, p. 12, of his Description of Ferro, says, that such a cloud, amongst the Greeks, called Typhon, and among the northern people Oes, for it absorbs the water, making a deep vortex in the sea, drew up some lasts of herrings, and afterward dropt them on Kolter, a mountain about twelve hundred feet in height, page 14. He imagines that it is these Oeses which in Norway attract stones, flesh, mice, and, what is more remarkable, lambs, and afterwards throw them down again; of which a further account will be given in its place.

PART I.

L

rocks,

rocks, stones, and mines. These I shall treat of according to my ability, till some superior pen gives a more perfect account of them, to which this imperfect Essay may prove an inducement.

As the mountains of Norway, in general, consist of rocks, intermixed with quarries of marble, free-stone, sand-stone, slate, mill-stone, &c. which, towards the sea, are almost stripped of earth, by the force of the winds, and in the creeks, and further in the country, are covered indeed with earth, but not more than a few yards deep, and very often less, one would be apt to think, that below this slender covering, the whole kingdom of Norway is but one solid stone, only of a different nature, figure, and height. But the error of such a conclusion is evident, not only from the many deep creeks running up the country, but fresh-water lakes, swamps, and fens, in some of which, though sounded with lines of several hundred fathoms, no bottom has ever been found. And to this may be added, that however mountainous and craggy Norway in general is thought to be, yet it affords many champaign well cultivated tracts of six, eight, or ten leagues, and more in extent, as Jedderen, the lordship of Nedenaes, Hedemark, and other parts, which are a considerable exception to the general rule.

S E C T. II.

The soil of
several kinds.

The soils, as in other countries, are very different here, consisting of a black mould, sand, loam, chalk, gravel, turff, mud, &c. In many places, when the inhabitants are digging deep for a spring in dry ground, all these kinds are found lying over each other in unequal strata, and three or four successions of them. The black mould which generally lies uppermost, is exceedingly fine and mellow, and fit for all sorts of vegetables; inso-much, that if not damaged by the cold, which seldom happens in the diocese of Bergen, the husbandman finds his labour amply compensated; for the ground yields five, six, or seven fold, and sometimes even more. His harvest consists for the most part of barley and oats, with some rye, and here and there peas and buck-wheat; but of these I shall treat more fully when I come to the vegetables, or products of the earth. I have only to add here concerning the soil of Norway, that betwixt the mountains, and in the diocese of Bergen, it mostly consists of an assemblage
of

of such earth as from time to time hath rolled down with the fragments of the rocks, or been washed off from the mountains, and settled either at the foot of the mountains, or on the sides, and by these accessions the vallies in many parts have been considerably raised. This appears evidently from one remarkable circumstance, that the fields in the vallies are naturally formed like a camp, the regular eminences and gentle slopes looking like the ramparts of a fortification. A strong instance of this, is the famous valley of Viig in Sognefiord, and Eidet in Nordfiord, where, a stranger, at first, would imagine the corn fields, as they lie raised above each other, to be so many batteries erected by art, though with some irregularity. All these terrasses have gradually risen from fragments of rocks, and eruptions of springs, which have repaired the loss and damage sustained in some places, by depositing the soil in other adjacent parts in these regular squares, which were thus formed by the light earth and sand, brought thither by the course of the waters*.

The sand of Norway is seldom of the white kind, which is at the same time the finest, but it is usually brown or greyish; and that on the sea-shore is of the coarsest, being rather particles of stone, as may indeed be said of all grains of sand, but particularly of these, their substance being so hard that they are not so easily dissolved, nor fit to be strewed about like the other. The little fine or white sand we have in Bergen, is never pure, but very much mixed with powder of muscle-shells, that is, with the finest chalky substance.

Syndfiord, Justedale, and some other parts afford a kind of shining sand, as if mixed with antimony, or with iron or tin-dust. This is mostly used for writing-sand, and as such exported. Tavernier, Chap. xxiii. p. 284. of his Travels to Persia, relates, that the Portuguese carried some of this glittering sand from Ormus to Lisbon, and at first made cent per cent of it; but this trade being founded on a false expectation, soon came to nothing. The

* Relative to this is the following passage from Baron Leibnitz's *Protogæa*, Sect. xxxix. pag. 71. *Cætera ingentium naturæ mutationum vestigia non nihil tangamus, habitatoribus fortasse antiquiora. Non illis tamen immorabimur quæ in nostris oris expressa non habentur. Ægyptum Nilo, Arelatensem agrum Rhodano deberi Aristoteles et Peiresius credunt; Nannius Bataviam munus esse Boreæ Rhenique. Certe flumina materiam advehentia spoliant superiores terras, frisque quotidie nostris detrimentis ditantur.*

usual grains of sand, or little round smooth and pellucid stones, are supposed, by Mr. Buffon, in his Natural History, lately published, to be only glass particles grinded, or a vitreous substance, the remains of the great universal dissolution, and of the vitrification consequent thereupon, which our earth appears formerly to have undergone: But on this we shall enlarge in the sequel.

Clay, both yellow and blue, is to be found in the creeks, but in greater plenty every where further up the country, particularly in Hedemark, and near Christiania and Drontheim, where they have lately begun to use it for earthen-ware, and if the same manufacture was carried on in other parts of the country, we might have a sufficient supply without importations from abroad. It is not much used for bricks, as most of the houses are built of timber, or of a kind of building-stone, which the Dutch, and other foreigners, bring hither as ballast, and sell them here. However, clay will, by degrees, come to be used for tiling, especially in the country, as the price of næver, or birch-bark, which has hitherto been the usual covering for houses, rises every year, and great numbers of trees suffer by the use of it. Other finer and richer clays of a dark brown and yellow colour, and used by painters, are also met with in several places, and particularly at Ringerige, is a kind of black clay, not inferior in its fineness to Terra-sigillata, and by the peasants used as blacking.

Turff, both brown and black, which is the best, is found in many parts, and chiefly where the wise Creator foresaw, that in the course of time it would be most necessary, namely, in the lesser and greater Peninsula's, or Udoers (tracts of land projecting into the sea to a considerable extent, and joined to the continent only by a small neck) where the west-winds hinder the growth of woods, which are further thinned by ship-building, so that without turf, the peasants and fishermen would be very much distressed, especially as they are obliged to fetch the greatest part of the timber for houses and barks from the continent. Now, as amongst the turf, both here and elsewhere, there are at the depth of some yards, branches and roots, and many very large, even stocks of firs and pines, which the turpentine has preserved, this shews the earth to have been gradually filled and as it were grown up from a mixture of leaves, twigs, moss, reeds, and the like;

and the sentiment of some philosophers attributing to it a vegetative or self-renewing power, by which it grows again, tho' slowly*, is confirmed by experience, the best instructor; for sufficient instances of it appear in Denmark, Luneburg, Friesland, Holland, England, and Picardy in France. On this occasion, I must observe, concerning the large bodies and parts of trees so frequently found among this vegetating turff-ground, that they are not such convincing testimonies of the deluge, as some account them; a much better proof may be drawn from other fossils, which never could be natives of the places where they are found; of this kind, particularly, is that entire skeleton of a whale, accidentally found in 1687, in Tistedale, near Frederickshall. It was buried with earth and sand, at least 240 feet under ground.

Skeleton of a
whale found.

The swamps and marshes, or Myrs, as they are called here, lie both on the ridges of the mountains, and in the vallies, at the foot of the steepest precipices; these, in many places, render the roads very unsafe, they being passable only in the driest summer months, and sometimes not even then, unless a kind of causeway is formed over them at the public charge, with thousands of logs and large pieces of timber laid across the marsh, which are soon rotten. In these places the ground is as soft as dough, yielding and moving under the foot, there being, probably, beneath these marshes, an abyss of standing water, which is thus weakly vaulted over. Near Læssøe, in the diocese of Christiansand, this timber causeway is carried on for near a mile, and if a horse, or a much less animal, happens to make the least wrong step, he sinks beyond recovery.

That there are coal-mines in Norway, and especially in the diocese of Aggerhuus, where the late governor Ditlef Wibe, a gentleman ever attentive to the prosperity and improvement of the country, employed some skilful persons in a search of them, not altogether unsuccessful, is what I have been informed of, but not with a certainty to advance any thing positive on the subject. The yellow, clear, and ropy substance on the surface of the water in

* The excellent, though not infallible philosopher, Baron Leibnitz, falls into a mistake, when he says, in his *Protogæa*, Sect. XLIV. pag. 82. *Torfam excisam renasci nondum compertum est, etsi aquæ advehant in vicinis locis jam natam.* And pag. 83, *Longum esset expectare dum torfa renascatur, nec forte hoc continget, nisi in orbe alio post Platoniam rerum revolutionem.*

the fens, which is said to be an indication of coal-mines, appears in great quantities in several places. If coal could be found in those provinces, which are not overstocked with wood, it might encourage the opening of more mines, the country almost every where abounding in metallic mines, besides those already wrought.

S E C T. III.

Two sorts of
mountains.

From treating of the low and level soil of Norway, we are naturally led to the mountains and rocks, with which the greatest part of Norway is covered. For the more accurate description of these they must be divided into two sorts; some being general, and extending themselves thro' the whole length of the country, whilst others are scattered about, or surrounded with a level country, tho' many of these may be considered as branches or excrescences springing from the roots of the former.

S E C T. IV.

The first sort of these mountains are such, as are properly called *Juga Montium Concatenata*, or a long continued chain of mountains; the direction of them here is not transversal, but from the south towards the north pole*. M. Emanuel Suedenborg, in his *Miscellanea Observata*, p. 7 & 9, assigns the cause to the winds prevailing at the time of the deluge, which gave this position and figure to the matter first hardened: "*Observari potest plerorumque horum montium dorſa a ſeptentrione verſus auſtrum tendere, &c. Extendi dorſa verſus auſtrum et boream indicio eſt, eoſdem ventos dominium tenuiſſe in oceano diluviano, qui jam in noſtro oceano.*" At the extremity of Finmark begins that ridge of high and rocky mountains called *Koele*, inhabited by the wandering Finlappers, who dwell sometimes on the west-side of the ridge which belongs to Norway, and sometimes on the east-side which appertains to Sweden†. This ridge, which in its course goes by several names, according to the several places contiguous to it, separates itself as it were into two arms; the first of which, in its progres-

* This is contrary to the other European chains of mountains, which in Hungary, Switzerland, France, and Spain, &c. run east and west. But the American Cordilleros, are in the same direction as our northern. Buffon's Nat. Hist. B. 1. Article 9.

† A worthy acquaintance, who when young was a missionary in Finmark, informs me, that the Koelen ridge, in many places, breaks into large vallies, and consequently is not so continued as further towards the south; and that it seldom reaches above four leagues in a continued chain.

tion, serves almost for a boundary betwixt the two aforementioned northern monarchies, and is called Rudfield, Sudefield, Skarsfield*, or more generally Sevebjerg, or the Seven mountains. The modern Swedish historian, Olaus Dalin, in his history of Sweden, Tom. I. p. III. speaks thus of the progress of the chain, "it proceeds as it were under water from Gottenburg, to a promontory in Jutland, called the Skager Riff, and forms a bank, or mound, not so deep as the sea about it, where is the best fishing in all those parts." The other main arm of the Koelen chain, begins likewise to change its name in the diocese of Drontheim, where, at some distance, it likewise alters its position for the space of ten Norway miles, first bending westward, as far as Roemsdal, and afterwards re-assuming its progress towards the south, betwixt the dioceses of Aggerhuus, Bergen, and Christiansand; and in the latter, about three Norway miles from Lister, terminates in a prodigious precipice, the like of which is to be seen in very few parts of the world. This arm, as has been observed, goes under different appellations, according to the adjacent countries, the first is Dofrefield, near Guldbrandsdall, then follow in order Lomsfield, Sognefield, Filefield, Halnefield, Hardangerfield, Joklefield, Byglefield, Heeklefield, and, lastly, Langfield, which last is likewise a general appellation comprehending the whole chain, as far as Dofre, and is by some called only Langfieldene, i. e. the long mountains. This mountain it is which divides Norway into the district called Soerdenfields, i. e. the south mountains, comprehending the diocese of Aggerhuus, and half that of Christiansand; and the district called Nordenfields, i. e. the northern mountain, tho', with respect to its situation, it might as well be called Westenfields, i. e. West-hill, consisting of the other half of the diocese of Christiansand, and those of Bergen and Drontheim. The height and breadth of this extensive chain are both very different, the mountain Hardanger being fourteen Norway miles over, whereas Filefield, computing from Laerdale, is scarce ten. Dofrefield is accounted the highest mountain of this country, if not of all Europe. Its perpendicular height indeed is not easily determinable, without calculating it by the

* Olaus Magnus, in Hist. Sept. Lib. II. Cap. XII. says, that an entrance or passage through it to the rocks was here cut out by the labour and industry of man; but this is very much doubted, and rather looked upon as a *Somnium de porta Eburnea*; at least it is what no Norwegian ever informed me of.

Barometer; for the levels on the side of the mountain, according to Peter Undalin's Description of Norway, in one place reach eighteen Norway miles, and in another twelve; and the road is so winding, that in the winter-road, one meets no less than nine times with the river called Drivaæ, which winds in a serpentine form along the side of the mountain. The bridges across this river make a dangerous appearance, as they are laid over roaring cataracts, or waterfalls, and but indifferently fastened to the steep rocks, which deters the better sort of travellers from chusing this road, tho' the shortest. The road over Filefield is the only one I am acquainted with from my own experience. This is a tedious ascent, thro' many windings, from Laerdale to the summit of the mountain, of about six Norway miles and a half, which in a perpendicular height towards Laerdale, may be computed at half a Norway mile, or 9000 ells. A proof, among others, of the great elevation of this mountain above the horizon of the champaign country, is the change from heat to cold, which within a few hours becomes so sensible, that the traveller may very well suppose himself suddenly transported from a hot summer to a piercing winter. I crossed it on the 28th of May 1749, having the day before, at my leaving Laerdale, observed the barley to be in some forwardness, and in the narrow vallies thereabouts, the heat was so sultry that at noon I was obliged to shelter myself at Borgen chapel: But after a few hours progress farther up the mountain of Filefield, I found myself rising as it were into the upper region of the air, towards the pure and subtle æther, and as much in the depth of winter as if it had been new-year's day; surrounded with snow and ice, which were the more painful to the eyes, as having so lately enjoyed the pleasing verdure of the fields and woods. The sun shone out very bright, but with so little heat, that tho' it was within three weeks of midsummer, all the waters, and particularly the fresh-water lake there, called Utreen, were frozen. I was very desirous of returning, being diffident of the assurances of my guides, that the ice would bear; for as the snow-water lay upon it, I apprehended it might give way: However, I got over in my sledge-chaife, which, as is here customary, was drawn by peasants, and not by horses.

Another

Another proof of the great height of this mountain, is the extensive prospect from it, in clear weather; for from Soeltind, a rock standing in the middle of the road, I had a view of the cataract of the river Bang, in Valders, a distance of about twelve Norway, or fifteen Danish miles, but on the other side my eye reached beyond Hallingdale, on the borders of Waas, consequently the crest of this mountain affords a prospect of thirty Danish or German miles. Another proof of the prodigious height of this mountain, is, that it causes a very sensible difference, in wind and weather, betwixt the north and south side, of which I have already observed in another place, that the inhabitants on this side the mountain seldom have the same weather or air, as those beyond it, the clouds, in striking against the mountain, being repelled. Hence also it is, that the winds, which in the diocese of Aggershuus cause fair weather, in that of Bergen bring rain, and so vice versa.

The highest parts of this whole chain of mountains are every where so smooth and level, that if they were not constantly covered with snow, carriages might travel much easier than in the lower parts, especially on the mountain near Hardanger, over which lies the road to Kongsberg, along which road large herds of cattle are driven, and great quantities of goods carried. But the utmost caution is necessary here, on account of the large chasms in the snow, which hath lain there before the memory of man, and is consolidated; these chasms, in winter, are covered with loose snow, and many persons not being aware of them, have irrecoverably sunk into an abyss, from whence the only chance of an escape, is thro' holes made by the birds for their retreat*; therefore part of the mountain towards Quenherret, being frequented by fowlers and sportsmen, is therefore called Fuglefang, i. e. the place for bird-catching. Peter Undalin, in his Description of Norway, p. 75, says, that all travelling over this mountain is prohibited, except from the invention of the cross, which is the third of May, to St. Bartholomew. Over Filefield, which is the post-road, and the road for the king's

* Such chasms in the snow are also seen in the mountains of Switzerland: "Il se trouve en divers endroits des montagnes de glace, &c. Les allemands les appellent Gletscher nous les appellons des glaciers, &c. Il arrive quelques fois qu'elles se fendent de haut en bas, ce qui fait un bruit horrible. Souvent la neige couvre tellement ces fentes que les voyageurs ne les decouvrent points y tombent et perissent." *Delices de la Suisse*, Tom. 1. p. 23.

carriages*, the way is marked all along with posts, at two or three hundred paces distance, that in snowy or dark weather, the traveller may not lose himself in these desert wilds, where no living creature is to be met with, except here and there a few rein-deer, and which cannot be constantly inhabited, unless by Finlappers, who, as their dwelling is among the Koelen chain in Nordland, and Finmark, 100 miles farther north, may live very commodiously here. In the valley called Smiddedal, there were formerly iron-works, but they have long since been discontinued, sufficient quantities of iron-ore having been found in other more convenient places; for besides the scarcity of birch and alder, the extreme cold, and the snow, with which the ground is covered nine months of the year, stunt the growth of trees.

Mountain-
stoves.

In some measure to relieve and refresh the traveller, two mountain-stoves, or resting-houses, are maintained on Filefield at the public charge, and three on Dofrefield, and furnished with fire, light, and kitchen utensils. There is but one way of avoiding this chain of mountains in the road from Sweden to Nordenfields, where it seems as it were interrupted by a long and deep valley, reaching from Romfsdale to Guldbrandsdale; and this road many prefer in their journies from the highlands towards the sea-coasts, to Romfsdale market with corn, butter, hides and furs, which they barter for fish. It was in their march through this long defile, that a body of 1000 Scotch, sent over in 1612, as auxiliaries to the Swedes, were, together with Sinclair their commander, put to the sword by the peasants of Guldbrand, who never give quarter. In these precipices and narrow passes consist the best fortifications of Norway, and to them it was owing, that in the last war numbers of Swedes met with the same fate as those Scotch; particularly, in the hollow-way near Krogkoven, where 200 men were cut off by lieutenant Cocheron, assisted by the peasants.

* At a small distance from the road is a chapel called St. Thomas's, one of the Votive-churches, as they are called, it having been an ancient custom, in sickness, or any other distress, to vow an offering there. There is still a sermon once a year, on the Visitation of the Blessed Virgin, which institution possibly arose from the history of this day, that Mary was gone early upon the mountain. Some superstitious, tho' possibly, well meaning people, resort hither with their offerings, in discharge of their vows; whilst others make the journey, as the minister complained, a pretence for carousals, assignations, and all manner of licentiousness and disorders.

S E C T. V.

To the other class of mountains, according to my former division, belong those which stand single, and are dispersed over the country, though they may in effect be considered as branches or shoots springing from the extended roots of the chains. These, likewise, are generally long in their form, and, like the others, stretch away from north to south, but with fruitful vales betwixt them, watered with convenient rivers, by which the floats of timber are conveyed to the sea-side for exportation. The inhabitants find these little mountains much more convenient for dwelling, they being exceedingly fruitful, the sides of them covered with fields and woods, whilst their summits afford plenty of pasture for the cattle and wild beasts; besides which, their bowels are treasures of silver, copper, iron, and other metals, which, both here and in Sweden, are lodged in the smaller, and not in those vast mountains; certainly a gracious disposition of the Creator, to facilitate the labour of mining. Tind and Gule in Tellemark, are said to be the highest mountains in that part, called Soendenfields. The diocese of Bergen, unquestionably, derives its name (which signifies hills) from the height and great number of this class of mountains, which are chiefly among the creeks, and on the sea-coast, and of these Siken, Ulrich, and Lyderhoorn, are the highest in this diocese, though Meldisk in Rosendale, Smoer-stak in Hougfield, Alden, or the horse in Sundfiord, Hornel in Nordfiord, Sneehorn and Skopshorne on Sundmoer, Romdalshorn, and others too many to be here enumerated, are more distinguished by their height*. The perpendicular height of these steep mountains, according to appearance, and the report of the people living near them, may be computed at betwixt 9 or 1200 yards, consequently they are higher, than if ten common church-steeple were placed one over the other. Strabo thinks the measure of the highest mountains in the whole world to be 30 stadia; Kircher, 43; Pliny extends it to 400, and Riccioli to 512; but M.

Many lesser single mountains in all the provinces.

* It is observable, that as many northern mountains are from their great height called Horn, some of the most distinguished mountains in Switzerland bear the same appellation, as Schreckhorn, Wetterhorn, Roemischhorn, Buchhorn, &c. which shews mankind to agree universally in their images and metaphors, even where they have no communication with each other.

Scheuchzer, in a particular tract, shews this measure to be vastly exaggerated.

Philosophical
Transactions,
Vol. 35, No
1.

The height of the highest mountains in Switzerland, which Julius Cæsar terms, *summas alpes*, is according to his conjecture, no more than 987 ells. Floeyfield, in the neighbourhood of Bergen, which, however, I do not imagine to be half so high as Hornel or Sneehorn on Sundmore, was by a trigonometrical mensuration performed last winter, found to be 200 fathom, or 600 ells high; consequently, Ulrich, which stands close by it, cannot be less than 800 ells.

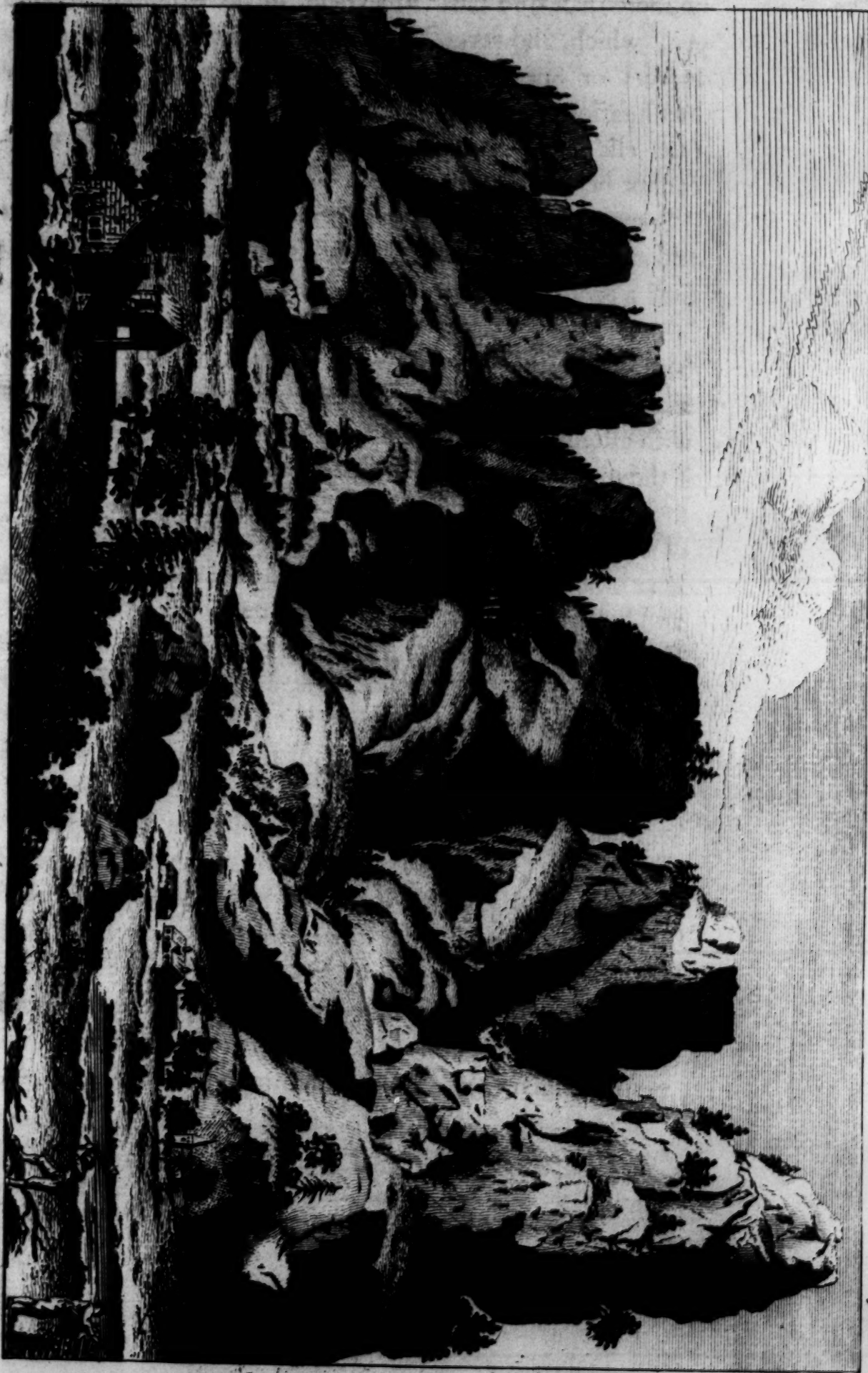
Some of these mountains are peculiarly remarkable for their figure and appearance. On the left hand, sailing up Joering creek, one sees such a groupe of crests of mountains, as resembles the prospect of a large city, with towers and old gothick edifices, and some of them being continually covered with snow, whilst the chasms in others make a way for the light to penetrate, the prospect fills a stranger with astonishment. Not far from thence, in the parish of Oeriskoug, is the mountain called Skopshorn, of which the mariners and fishermen have a view at 16 leagues distance, when they have lost sight of the rest. On the highest crest of this mountain, it has the appearance of a complete well-built fort, or old castle, with regular walls and bastions. It is an old tradition, that a girl who was attending a flock or herd, for a wager climbed up to the top, and according to agreement, there blew her horn, but was never seen after; upon which, her relations, according to an ancient superstition, imagined she had fallen into the hands of the pretended subterraneous inhabitants of the mountains. Perhaps the truth is, that the girl was not so fortunate in coming down as in getting up, and that she fell into some cavity, where her body never could be discovered.

See plate 11.

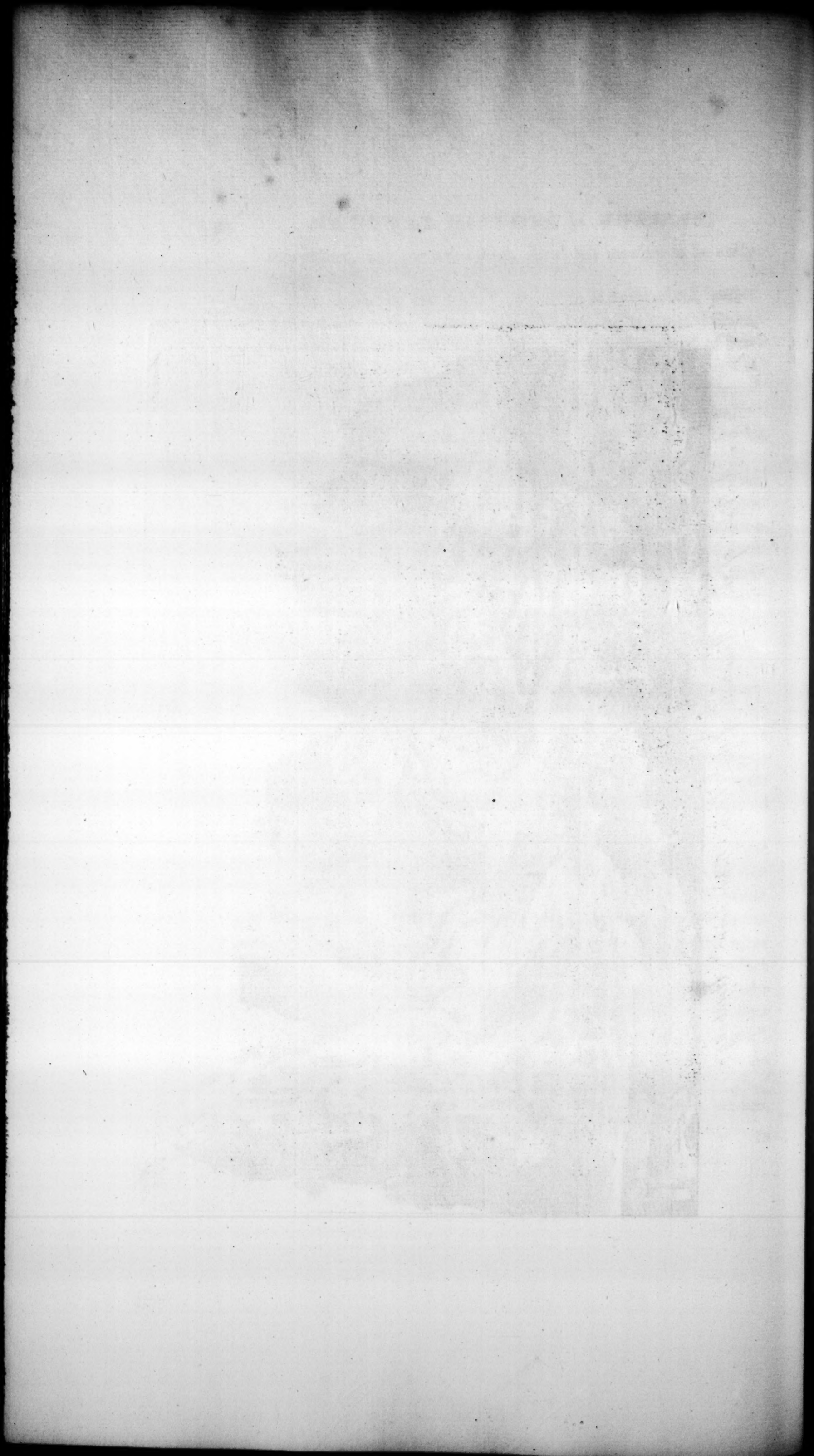
The Seven
Sisters.

Near Alstahoug, in the district of Helgeland, is a range of mountains of a very singular aspect, having seven high pinnacles, or crests, known by the appellation of the Seven Sisters, and which are discernible sixteen miles off at sea. A friend of mine, who ventured to the top of the highest of these crests, thinks their perpendicular height to be something above a quarter of a league*.

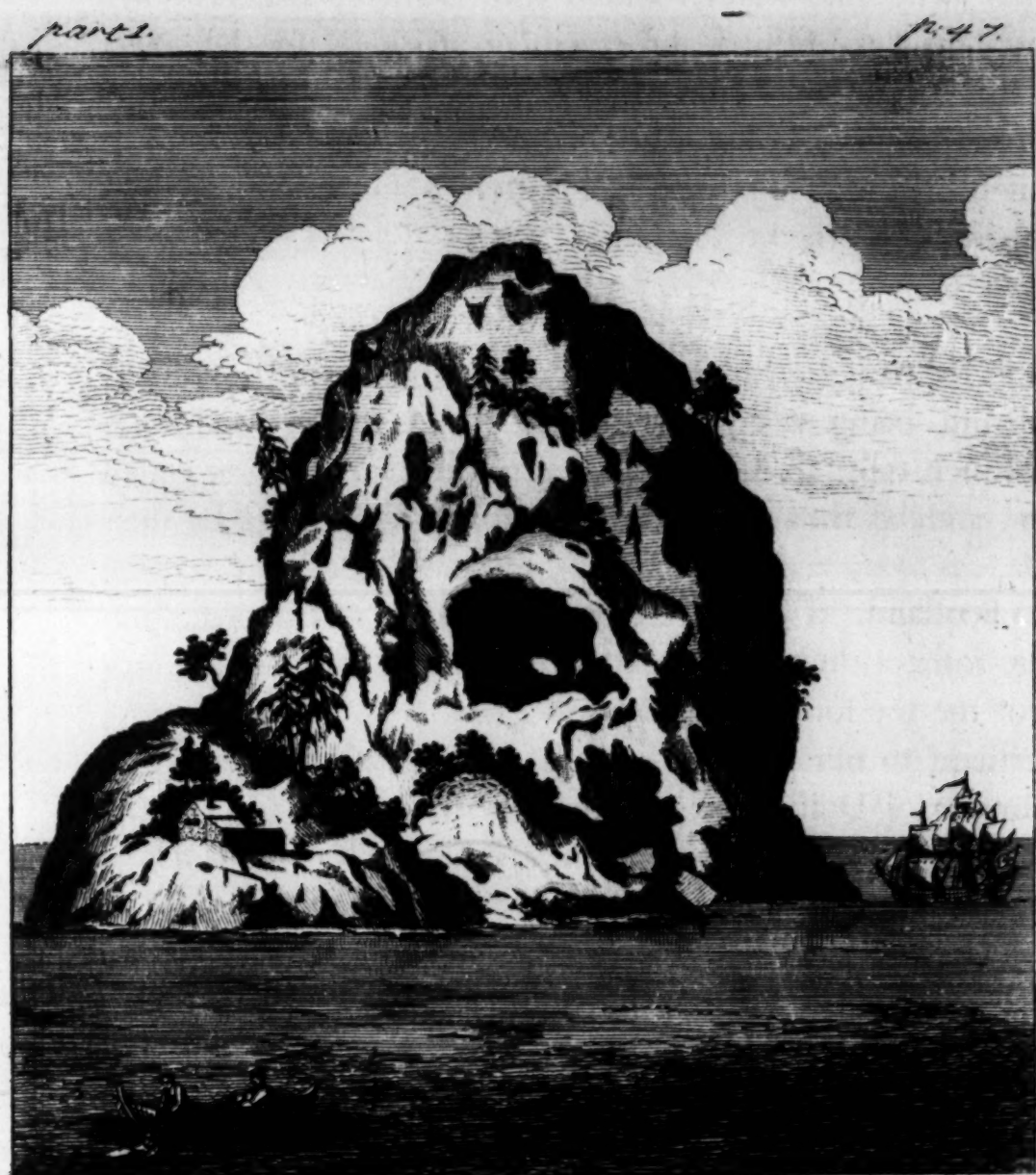
* This appears a very extraordinary height, for one of these separate hills, which have always been accounted but small in comparison of those of Dofre and File. I have besides been informed by several maritime persons, that towards the north, the height of the mountains, immediately beyond Sundmoer and Nordmoer, decreases, as it increases after passing Stavanger, and approaching towards Bergen.



1
A View of the Mountain of the Seven Sisters near Watnaboug







2 The Rock of Torge Hatten in Norway.



In the same district southward is the noted mountain of Torghatten; so called from the likeness of its top to a man's head with the hat on, under which appears a single eye, which is formed by an aperture, passable throughout, an hundred and fifty ells in height, and three thousand in length, thro' which the sun may be seen; it likewise affords a coarse kind of agate, but which will admit of a polish. On the top of this mountain is a piece of water, or a reservoir, of the dimensions of a moderate fish-pond. The rain-water, which gathers there, trickles down the mountain thro' fissures and cracks on its side. In the lower part of this mountain is also a cave, full of rugged windings. A line of four hundred fathom, being tried out of curiosity, to measure this hiatus, did not reach the bottom; and it was thought too dangerous to proceed further.

The mountain of Torghatten.
See plate 111.

S E C T. VI.

Such secret passages, and wonderful caverns in the mountains, are far from being uncommon here. At Herroe in Sundmoer, I heard much talk, from the common people, of a cavern called Dolsteen, and, as they are apt to magnify all such things by their own imaginations, they conceit that it reaches under the sea, all along to Scotland. I desired the two ministers of the place personally to inform themselves of the nature of it, and they accordingly sent me the following written account.

Deep and long cavities, and as it were secret passages in some mountains, and conjectures on the origin of them.

Pursuant to our promise of taking a view of the cavern in the mountain of Dolsteen, we went thither on the 16th of July 1750; its entrance was the height of a full-grown man, and it is two fathoms in breadth; but we immediately found it to increase in both dimensions, even higher and wider than Herroe church. The sides were perpendicular, like the wall of a house, rising into a kind of vaulted roof. It stretched itself S. W. and N. E. till about the middle, where we met with a descent like the steps of stairs, and there it inclines more to the east, but this deflection is not above three or four fathom long, when it again falls into its north-east direction. On each side, at the bottom of these steps, was as it were a bank of clay, on which we rested ourselves, and at the end of these banks, likewise on each side, was a kind of door with an oval top, but upon viewing it with our

Cavern in Dolsteen.

lights, we found it to be but half an ell lower than the other part of the mountain. Hitherto the height and breadth continued as before; but now it began to contract itself, and at the same time to descend lower. There we could hear the dashing of the waves, and the sea was at least an equal height with us, if not over our heads. Soon after we came to some more steps, but being not inclined to venture further, we threw down a stone, and heard its eccho for the space of a minute; but whether it fell into the water, or on the dry rock, we could not distinguish. Some conjecture may be formed of the length of this cavern, from our having burned two candles in our progress and return."

Another remarkable instance of a like secret passage in a mountain, I shall produce from my own experience. Hearing at the parsonage of Oerškoug, that in the district of the annexed chapelry of Strande, not far from thence, a stream had been found, which issued through a rock from the side of a mountain called Limur, and over it a cavern which probably followed the stream, but of the length of which I could procure no account; I resolved to examine it myself, as on my visitation to Nordal I was to pass near it. I furnished myself with a tinder-box, candles, a lanthorn, and a long line to serve me instead of Ariadne's clue. My boat put me ashore at the foot of the aforesaid mountain of Limur. But it being extremely steep, we were obliged to climb with our hands as well as feet, and sometimes were hard put to it to clear our way through the hazle and alder-bushes. On the side of this laborious ascent, we met with a rivulet, streaming out, which directed us to the cavern. It is indeed something wonderful, being a kind of natural conduit, formed purely by the force of the water through the solid rock, which was a compound mass, mostly consisting of grey pebbles, but about the conduit, of a clear grey marble with bluish veins; had this natural structure been raised by human skill, it would have been a work of no small expence, for a few paces after getting through the thicket, which almost hides the aperture of the cavern, one is surprized with a vaulted passage of pure marble, without the least flaw or breach, but with several angles and protuberances, all so polished, as if it had been a paste mouldered into smooth globular forms. About a hundred paces forward, the passage continues in a straight direction,

rection, then winds off to the right with ascents and descents, and in some places growing narrower, and in others widening to double its former breadth, which, according to my admeasure-ment, was about four or five ells, and the height about three; thus two persons could go abreast, except that they were now and then obliged to stoop, and even creep, and then they felt a damp vapour like that of a burial-vault. This prevented my penetrating so far as I had intended. Another thing remarkable, was the terrible roaring of the waters under us, the course of which was what most excited my wonder, as over it lies a pavement of smooth stone, inclining a little like a vault on each side, but flat in the middle, and not above three fingers thick, with some small crevices, through which the water may be seen. If it be asked how far this covered-way reaches? I make no question but its length is equal to the course of the stream, and that it has been produced by the falling of the water, which in length of time, has perforated these rocks agreeably to the ancient maxim,

Gutta cavat lapidem, non vi, sed sæpe cadendo.

And this is more particularly confirmed by the many projections which have been levelled, or undulated figures, which, as I have before observed, are to be seen on the roof, and along the sides. If it be asked again, where is the spring of this stream? the peasants hereabouts say, that on the uppermost ridges of the mountain, which is at least a hundred fathom high, almost perpendicular above the cavern, there is a standing-water of about a quarter of a league in circumference, and unquestionably formed and supplied by the frequent accession of the rain, and the melted snow from the other parts of the mountain. It is no difficult matter to judge how the uppermost dry vault comes to be of such a height over the channel of the river, by which it is caused; for the cavity in its beginning could not have been so high, but by length of time, the stream, of which the upper vault was then the bed, penetrated to its present depth, and perforating the mountain, the particles which it detached, as sand and gravel, settled on the ground, forming as it were a small and level pavement, which is now a cover to that stream, of which it had been the bed. I am the more confirmed in these thoughts, by a second view I took of
this

this cavern some days after, on my return from Nordal, when I ventured further in, though not so far as two men whom I had with me. We then perceived, by the help of a lanthorn, through an aperture under our feet, that the stream had made itself another flat and smooth bed of little stones, or a gravelly bottom, like that under which it now runs, consequently in time, it will likewise penetrate through this new vault, which will then become its roof, and thus in another bottom, proceed to lay the foundations of another new vault :

Tantum ævi longinqua valet mutare vetustas.

However easily those caverns, through which there is a water-course *, may be accounted for, yet it is more difficult to explain the origin of the many dry caverns and secret passages in the rocks, like that of Dolsteen, of which more instances might upon inquiry be found in other mountains. The opinion that carries the greatest weight with me, is that of Woodward, in his *Theory of the Earth*, p. 85, that the whole mass of terrestrial matter, after its dissolution by the deluge, and its subsequent reunion, was soon after, when dried and hardened, by some secret cause in the earth itself (a universal earthquake, or the like) again separated and thrown into such confusion, that the several strata, or layers, sunk in some places, and rose in others: this naturally gave the surface of the earth the appearance of a crackt or shattered building, with many chasms betwixt its ruins, till at length the earth shall be entirely levelled.

S E C T. VII.

Effects of the deluge in the dissolution and softening of the hardest bodies, in which their former softness is plainly discernible.

However true it be that this opinion of Woodward deserves the preference, beyond any of the conjectures of Burnet, Whiston, or other theorists on the effects of the deluge, yet it has not been exempt from opposition, and particularly is combated by Elias Camerarius, and but lately by Mr. Buffon. My reason for adopting it here, is, that of all others, it most facilitates the discovery of the origin, not only of the cavities, but of the mountains themselves: He does not deny, as Burnet does, the existence of mountains and hills before the deluge, but is of opinion, that they

* Of this kind is that so remarkable cavern in the Peak in Derbyshire.

were

were all dissolved, and as it were liquified, and that the whole terrestrial mass, with its detached and intermingled parts, at last came to a coalition above the abyss, in the form of a convex vault, one stratum above another, stone, earth, sand, chalk, and other substances, subsiding quicker or slower, according to their specific gravities; the several substances thus obtaining their collected strata, the outward shell of the earth was smooth and level; and Burnet, in his Theory of the Earth, holds this to have been the state of things from the creation to the flood, when the water broke up and demolished the smooth shell, and this disruption mingling different bodies, threw all things into their present disorder; though the wisdom of a divine œconomy be still universally conspicuous. Woodward, in answer to the question, how the surface of the globe, which, according to his opinion, was rendered smooth by the deluge, fell into its present irregularity? how the middle or lowest strata were thrown uppermost, and such a general confusion prevailed? supposes, that immediately after the deluge, the abovementioned great change and dissolution * took place, by which some detached strata stood with one end in the air, and the other submerged, that the place of the depressed was filled by the elevation of parts or fragments of different layers. Tho' this be but an hypothesis, yet it appears to me the only one, which accounts for and illustrates what I have most wondered at, in my speculations on the stupendous structure of our northern rocks, and particularly the strata of their different parts. In these rocks, which are composed of masses very different in colour and figure, it is plainly seen that the substances thereof have been as it were liquified, and afterwards subsided stratum super stratum, yet not always horizontal, according to the laws of motion and gravity, but rather in general, oblique, or in various, and in some places, even in perpendicular directions. The cause of this position cannot be cleared up without admitting the aforesaid opinion of Woodward, at least till some more rati-

* Several causes of this may be alledged, but in my opinion this appears the most plausible. As a new wall, if the foundation gives way ever so little, cracks, and even sinks and falls to ruin; the like must have happened soon after the flood, when this new mixture came to be dried; and this siccidity must occasion crevices and apertures in the lower part, and consequently in its upper surface, which necessarily followed the sinking foundation, upon the water discharging itself from the other parts into the ocean.

onal solution shall be hit upon. What I most lament, is, that this learned and ingenious writer has not fulfilled his promise so often repeated, of demonstrating both the possibility and reality of his several hypotheses, and confirming them by experiments. He had for this end projected a large work, of which his Theory of the Earth was to be only introductory. The chief objection, which I could have wished to have seen answered by him, relates to the hard substance of stones, which he takes for granted to have been also dissolved and liquified.

Conjecture on
the dissolution
of the earth.

I ask, by what means this liquefaction was wrought at the time of the deluge? if recourse be had to the supposed central fire, from which the globe derives its levity, &c. and it be said that this by coction could dissolve the hardest quarries of marble, (the veins and streaks whereof sufficiently shew its former softness, and the loco-motion of its parts, not to mention the heterogeneous things found in it) then Noah and the animals in the ark must have suffered, unless we take the liberty of forming a new hypothesis, that this coction was not universal at once, but affected only a certain part of the globe, and certain tracts of its surface*: Strange and novel as it may appear, to assign such a vehement heat to the water of the deluge, yet this was a very ancient tradition, if we pay any regard to the words attributed to the devout Pionius, who suffered martyrdom in the year 250, under the emperor Decius, and among other things spoke thus to his unbelieving persecutors, "Ye yourselves, from your old traditions, acknowledge that the deluge of Noah, whom you call Deucalion, was mingled with fire, yet do you but half understand the real truth of this matter." Now though no great stress be to be laid thereon, yet is this conjecture far from being so improbable as that of Burnet, who makes the chaos of our globe to have been the remains or ashes of a consumed and vitrified comet, which by the creation, acquired a new life, form, and disposition†.

But

* Who knows whether any volcanoes existed before the deluge, especially, whether it did not previously accumulate vegetable and animal fragments from the resinous slime of the bottom of the sea, or at least great quantities of fuel, to the sulphureous and otherwise inexhaustible ore already deposited there? Who at least will dispute the probability that the sea, furnishes fuel to these dreadful and incessant subterraneous fires, all volcanoes being near the sea. D. Joh. Friederich Henkel's *Pyritologia*, Cap. v. p. 308. seq.

† The celebrated naturalist Mr. Buffon, in several parts of Tom. i. of his *Natural History*, in some measure closes with this hypothesis, tho' he differs very much from him

But whenever this fusion happened, or whether the Almighty made use of it as a means or not, or whatever means he chose for that end, for I do not concern myself with those chimeras; yet nature and experience speak sufficiently plain to the point, and shew first * the possibility of it, no kind of stone whatever, whether pebble, marble, or flint, having ever been of such a hardness, as not to be capable of being resolved into its most minute particles, melted, liquified, and again vitrified, especially by a good burning-glass †. In the next place, the reality of the matter appears beyond all doubt, to those who have an opportunity of viewing the various figures and colours of the stones, in the rocks and mountains, some ignited, others striated, and many heterogeneous bodies intermixed with them, of which Norway affords multitudes, especially on the sea-coast. If we consider these attentively, they manifestly evidence, that anciently their matter was soft and liquid, but again indurated, and that after this induration, or petrification, they were in many places again detached and confounded, as if hewed through, broken, split, and raised from their first horizontal state to an oblique, and in some parts a perpendicular position. If the before-mentioned profound theorists had taken a view of this country, it would have furnished them, far beyond any other, with the strongest experimental proofs and illustrations of their hypotheses ‡. I shall, however, adduce some remarkable proofs from the heterogeneous solid bodies, so frequently found entombed as it were in other solid bodies,

Wonderful
mixture in the
mountains.

him in the circumstances. He turns our globe into a fluid or liquified matter, shorn from the sun by a comet, which mixed itself with it. Could this have been expected from a man who treats all hypotheses with the utmost contempt?

* Incendiis et inundationibus varie transformata sunt corpora, et quæ nunc opaca et sicca cernimus, arsisse initio, mox aquis hausta fuisse, tandemque secretis elementis in præsentem vultum emeruisse, credi par est. Omnis ex fusione scoriæ vitri est genus, scoriæ autem assimilari debuit crusta, quæ fusam globi materiam, velut in metalli furno obtexit, induruitque post fusionem. — Ipsa magna telluris ossa, nudæque illæ rupes atque immortales filices, cum tota fere in vitrum abeant, quid nisi concreta sunt ex fufis olim corporibus, &c. Leibnitz Protogæa, § III. p. 3, 4.

† Mr. Becher, in his *Physic. Subterr.* shews, that the hardest stones are dissoluble by water and fire: "Solius ignis et aquæ ope, speciali experimento, durissimos quosque lapides in mucorem resolvo, qui destillatus subtilem spiritum exhibet." Again: "Est etiam certa methodus, solius aquæ communis ope, filices et arenam in liquorem viscosum, eundemque in sal viride convertendi et hoc in oleum rubicundum." This last method, which does not require the use of fire, is most agreeable to Woodward's System, which on that account, among others, appears the most eligible.

‡ That all stones were anciently a soft or slimy paste, is admitted as a tried and unquestionable certainty, in the *Memoires de l'Academie Royale*, ad A. 1716, p. 14.

See plate iv.

(*solida intra solida*.) In the district of Evindvig, six leagues north of Bergen, is a place called Stenefund, where the mountain, for half a quarter of a league, abounds with such petrified bodies, as are sought for in the cabinets of vertuosos; many kinds of *Cornua Hammonis*, large and small snakes, muscles, worms, insects, and many others. This cannot be called a *Lusus naturæ*, which expression, in this sense, is rather a *Lusus poeticus*, and amounts only to a paltry evasion, invented by persons who are disposed to deny what is undeniable. All these figures appear there as if they had been impressed into a paste, or dough, and no rational inquirer can entertain any doubt, that the rock was as soft as dough, or paste, when first these bodies were intermixed with it. I shall pass over many lesser examples of this kind, such as St. Olave's serpent in Nordal creek, which, as far as it concerns the fact, is fabulous, the monks having made use of it to attribute to St. Olave the miracle of encountering this huge serpent, and throwing it up against the place where it is now seen; but that it has hung there ever since the deluge, is not incredible, unless its dimensions of many fathoms render it so. But this doubt will likewise vanish, when I come in order, to speak of the northern sea-reptiles, and other extraordinary sea-animals. In the quarry of marble near Musterhaun, seven Norway miles south of Bergen, in the surface of the rock, which is as it were the outward crust of the marble, or a porous slime, called *Dogstein*, we see several small round holes, like those observable in tallow, or in wax, when congealing after fusion; and that the whole mass of this quarry, together with its veins, were formerly in that state, appears to me unquestionable from the answer of one of the workmen, when I asked him, if he had never met in the marble with something else, or some substance which had the appearance of a different substance? his answer was, "This happens very seldom, yet both myself, and others of my trade, have sometimes met with it, and we have found in the middle of blocks of marble, snakes, muscles, sand, stone, and other such things, so inclosed in on all sides by the marble, as if they belonged to it, although they immediately loosen and drop out as a foreign substance. When this happens, it is usually followed by such a violent stench, as over-powers us, unless we turn immediately aside from it." This last circumstance

I im-

Part I.

pag. 54



The Mountain near Stone Juid



I impute to the long confinement of the air. In my little collection of northern and other natural curiosities I have several such petrified pieces, which exhibit *solidum in solido*, and other indications of a sudden induration of these formerly fluid substances, by which fishes, worms, snakes, and other creatures have been inclosed in stones, as we meet with insects and the like in amber*.

Instead of dwelling on these things I shall corroborate the matter by a conjecture of my own, relating to three cavities in a rock in the district of Rake, three quarters of a Norway mile from Fredericshall. These cavities at their entrance are round, and each not above two ells in circumference. Two of them are not very deep, and so are not particularly remarkable, as they might have been formed by human hands with instruments; but the third cavity, on that account, deserves the more admiration from the curious; for tho' not wider than the other two, and so smooth and regular, that it might be mistaken for a work of art, yet it would be absurd to suppose this, on account of its unfathomable depth; for when in order to form a computation of it, a small stone is dropped down, the echo does not in less than two minutes give any room to conclude that the stone has reached the bottom; and the sound it returns is quite melodious and pleasant, not unlike that of a bell. This profound cavity, which is too narrow to receive a human body, much less to allow room for the motion of the hands, could not therefore possibly have been dug or bored by human art, consequently it must be of equal date with the world itself, or, which indeed is most probable, it was formed by the deluge, and possibly in this manner; the substance of the rocks being supposed soft and impressible like a paste, a round stone, previously indurated, might fall on it from some eminence, and by its own weight force a passage quite through. And if the two other cavities, which are not very deep, proceeded from a similar cause, the stones which fell in there must have been lighter, or have met with a more inspissated or harder matter.

* I am not little pleased that Mr. Buffon has found the like, and other adventitious bodies in marble and chalk. *Natural Hist. Tom. I. Art. VIII.*

S E C T. VIII.

The origin of
all mountains,
rocks, and
lesser stones,
deduced from
the premises.

This position being established, it opens a way to an easy explanation of the origin, both of the rocks, mountains, and hills, after the first plane had been formed by the deluge. The hills, of which few here are of such dimensions as to be classed among the mountains, might very easily be aggregated by the mere force of the water, but the rocky mountains being of a denser substance, seem to have been elevated from beneath, in a convex form, by a violent force of subterraneous wind, water, and fire, heaving them up, and scattering them about in so many protuberances*; and if this happened, before the substance of the stones became indurated and fixed, then the external wind did likewise, according to the conjecture before quoted, from M. Swedenburg's Observations, leave so many vestiges of its violence both in the extent and figure of them. This accounts, unquestionably, for the innumerable fissures, disruptions, and chasms, which appear like so many mountains fawn asunder, across or lengthways†. And hence many such apertures in the mountains are filled with a slimy matter, of a subsequent induration, and by the country-people called Hejeitel. This projects in a range of about an ell, or half an ell in breadth, betwixt the other lapideous strata, and throughout the whole length or bulk of the mountain, which thus from the variety of its colours makes a very pleasing appearance. Of these Hejeitels, or separate veins, some consist of marble, or alabaster, some of agate, and some of other white, red, blue, or brown kind of stones, which, especially towards the sea-coast, where the rocks are bare, form many curious variegations. Hence likewise remain on the surface the many detached blocks and

* Scio quosdam suspicari intumuisse aliquando terram ab erumpente spiritu, surrexisse montes ex planitie, erupisse insulas ex mari, qualis apud Cedrenum in historia miscella memoratur insula nata sub Leone iconomacho.—Ego etiam facile admittam initio, cum liquida esset massa globi terræ, luctante spiritu superficiem varie intumuisse, unde illi mox indurescenti primæva inæqualitas; neque etiam diffiteor, firmatis licet rebus, terræ motu aliquando vel ignivoma eructatione, monticulum factum. Leibnitz Protogæa, Sect. xxii. p. 36. seq.

† Mr. Buffon, Part I. p. 64, according to his system, assigns the following cause of the perpendicular fissures and chasms in the mountains; that the waters gradually subsiding, and the paste of the rocks being dried, the shafts thus contracted, necessarily separate, and leave an aperture betwixt them, as the like daily happens when mortar, starch, &c. harden. Whereas the horizontal rents in mountains, which are much fewer, run according to the several strata of the substances, which are observed to lie over each other, like the leaves of a book.

fragments, like lumps of mortar, or a soft paste, scattered not only in the vallies and creeks, where they are called *Sciffars* and *Flies*, but also on the tops of the highest mountains; many such being found here of the bulk of a common house, consequently too ponderous to have been raised to such a height by the hands of men, and besides of no visible use.

This likewise is the origin of most of those pebbles, which are found scattered in all parts of the globe, and which by length of time become somewhat smooth and even. I say most of them, and allow that some sandy stones may be said to grow, and from this cause, that a superficial layer of sand or clay was indurated by the sun. But that stones in general, especially the hard pebbles, grow, and consequently are endued with a vegetative life, or internal power to imbibe their nourishment from the earth, this is certainly one of the most absurd notions that ever was received among judicious men, and especially in an age in which the causes of things are so minutely and accurately investigated. If after clearing a piece of ground of the small stones, there appears to be a succession of them, this is owing to a hard frost within the earth, and the swelling of the earth by the ensuing thaws, whereby, every year, the stones are carried up to the surface. That mountain-crystals, and possibly more valuable gems, may grow like sap or juices, which gradually become tinged with the colours of the minerals, and according to the quality and arrangement of the saline particles, concrete and shoot into cones, I am very willing to admit; likewise, that the water carrying away some lapideous particles, here and there in the cavities of the mountains, reduces them to a paste, which afterwards being dropped, remains suspended like icicles; and there forms what is therefore called the Drop-stone or *Stalactites*.

Stones not vegetative.

S E C T. IX.

Before I take my leave of the mountains, and particularly of our Norwegian rocks, I must, agreeably to my purpose, mention something further to the praise of the great Creator, and to incline the people of Norway to be gratefully contented with the habitation which God has assigned them. I previously grant, as

The inconveniencies and detriment to Norway from so many rocks and mountains.

all

all earthly enjoyments are mixed with bitters, according to the poet's saying,

Omnis commoditas sua fert incommoda secum,

so the inhabitants of a mountainous country may in general be said to labour under more inconveniencies than others; as the country, in the first place, is less fruitful, the arable ground being but little in comparison with the wastes and deserts. The disproportion in many provinces, especially those which are entirely over-run with mountains, betwixt their produce and the inhabitants is very great, they being under a necessity of procuring one half of their sustenance out of the sea. In the next place, the villages cannot be so large, compact, and convenient as in other parts; but the houses lie scattered among the vallies, generally at half or a quarter of a league distance, although up the country the farm-houses are both larger, and stand thicker than in the vallies of Bergen, where they are the smaller, from the vast extent of the mountains. In some places, as in the creeks in Ulland and Nordal, the peasants houses stand so high, and on the edge of such a steep precipice, that ladders are fixed to climb up to them; so that when a priest is sent for, who is unpractised in the road, he risks his life, and chiefly in winter when it is slippery. In such places a corps must be let down with ropes, or be brought on men's backs, before it is laid in the coffin. The mail likewise in winter must, at some distance from Bergen, be drawn up over the steepest mountains. Under this head of inconveniences we may also reckon the very difficult roads, extremely so to the day-labourers, but particularly to travellers, who cannot without terror pass several places even in the king's road, over the sides of steep and craggy mountains, and on ways which are either shored up or suspended by iron bolts fastened in the mountains, and tho' not above the breadth of a foot-path, without any rails on the side, as indeed it is impossible to fix any; not to mention the sudden rising of the rivers, which they must either wade thro', or cross over on ruinous bridges*. In this diocese the bridges are not

* In the narrow pass of Naeroe, leading to Waas, is a very remarkable piece of antiquity, being a way suspended on iron bolts, which the famous king Suerre, in the year 1200, or above six hundred years ago, caused to be fastened into the rocks,

not built of any extraordinary strength, being used only by foot-passengers, or horsemen; for there is no road for carts, and many peasants here who have not so much as seen a cart, when they come to Bergen, look with amazement at it, as a curious machine. A fourth evil resulting from the mountains, and especially in this province, is the shelter their cavities and clefts afford to wild beasts of prey, which renders it difficult to extirpate them. It is not easy to describe what havock lynxes, foxes, bears, and especially wolves, make among the cattle, the goats, hares, and other useful animals. In the chapter of the wild beasts we shall give a more particular account of this. Another very pernicious evil is, that the cattle, goats, &c. belonging to the peasants, often fall down the precipices, and are destroyed. Sometimes they make a false step into a projection called a mountain-hammer, where they can neither ascend nor descend; on this occasion a peasant cheerfully ventures his life for a sheep or goat; and descending from the top of a mountain by a rope of some hundred fathom, he flings his body on a cross-stick, till he can set his foot on the place where his goat is, when he fastens it to the rope to be drawn up along with himself. But the most amazing circumstance is, that he runs this risk with the help only of one single person, who holds the end of the rope, or fastens it to a stone, if there be one at hand. There are instances of the assistant himself having been dragged down, and sacrificing his life in fidelity to his friend, on which occasion both have perished *. The sixth,
and

to make a passage for his army, doubtless for his cavalry, which could not possibly have passed it, had they not been Norway horses, these being accustomed to climb the rocks as nimbly as goats. I add, that the most dangerous, tho' not the most difficult road I have met with in my several journies in Norway, is that betwixt Skogstad and Vang, in Volders; along the fresh-water lake called Little Mios, the road on the side of the steep and high mountain, is in some places as narrow and confined as the narrowest path, and if two travellers meeting in the night, do not see each other soon enough to stop where the road will suffer them to pass, and chance to meet in the narrowest parts, it appears to me as it does to others whom I have asked, that they must stop short, without being able to pass by one another, or to find a turning for their horses, or even to alight. The only resource I can imagine in this difficulty, is, that one of them must endeavour to cling to some corner of this steep mountain, or be drawn up by a rope, if help be at hand, and then to throw his horse down headlong into the lake, in order to make room for the other traveller to pass.

* Of these melancholy, and not unfrequent accidents, of a man or a beast falling some hundred fathoms from the precipices, it is observed, that the air presses with such force against the bodies thus falling, that they are not only suffocated and deprived of life long before they reach the ground, but their bellies burst,

and not the least danger, to which the inhabitants in this and some other provinces, tho' seldom in Osterland, are exposed, is, that sometimes by a sudden disruption of a rock, great damages are done to the cattle, fields, and woods, and sometimes houses and families are involved in the destruction. These disruptions (called Steenskreed) generally happen in the spring, when the dilation of the strata of earth, occasioned by the thaws and rains on the summits of the mountains, loosens some adjacent small stones, which as they roll down, gradually gather more, and carry before them, or after them, such heaps of stones, sand and rubbish, that all the trees in the way are torn up, and the mountain is so stripped of all its covering, that it has the appearance of a beaten road; and if the earth chance to lie too deep for this mischief, many deep trenches, or long and narrow vallies are formed, the soil of which is thrown on the contiguous fields and pastures, which in time, tho' it requires some years, recover their verdure and fertility. The greatest and most destructive fall of stone as well as snow, of which I have elsewhere made mention, happened in this diocese about Candlemas, in the year 1679, when many cultivated tracts of land were destroyed, several houses demolished, and, only in the district of Sundmoer, 130 souls perished, and all this as suddenly as in other countries by earthquakes.

See plate v.

There is another much more terrible, and a more extraordinary natural accident, which in some degree resembles this last; it is distinguished by the name of Bergrap; the mountain being as it were convulsed, gives way, separates, and falls down on the country; sometimes in small pieces, and then the damage is but slight; but sometimes, tho' seldom, entire crests of rocks some hundred fathoms in length and breadth have fallen; which occasions a violent agitation in the air, and has all the appearance of a prelude of a general destruction of the world. The vestiges of such a Bergrap, are most evidently to be seen at Steen-broe, in Laerdale, in

and their entrails immediately gush out; which is plainly the case, when they happen to fall into a creek, or any other water, for all the limbs remaining whole, but the belly is burst. The certainty of this matter throws a light upon an obscure passage, especially in Luther's and our Danish translation of the Bible, where it is said, Acts, chap. i. 18. *he hanged himself, and burst in two, and all his bowels fell out.* On the contrary, the words are, *περηνης γενομενος ελακησε μεσος*, *præceps factus est, falling headlong, he burst asunder in the midst*, is the English translation, and agrees perfectly well with the sequel, according to the above observation, which in this country is but too often exemplified.

the

Part 1.



P. 6a.

The Galleries a dangerous way under the Mountain, Folefield.



the gallery, as it is called, where a mass bigger than any castle in the whole world appears to have fallen from the rock; the pieces are, some of the bulk of a house, some less, but all as pointed as if millions of pieces of broken glass lay there. The river roars prodigiously as it passes through these stupendous ruins, over which, however, a way has been laid with infinite labour, but certainly one more difficult is not to be met with throughout the world.

When such a Bergrap falls into a creek, or any deep water, the fragments indeed are out of sight, but their submerision causes such an agitation of the water, as to overflow and carry away the adjacent houses, and even churches; of which, on the 8th of January 1731, there was a remarkable instance in the parish of Oerskoug, and in the annexed parish of Strand, on Sundmoer, where a mass, or promontory, called Rammersfield, hanging over Nordal-creek, being undermined by the water, suddenly fell down, whereby the water, for the space of two miles, swelled with such force, that the church of Strand (which has since been rebuilt on a higher spot) though a direct half league on the other side of the bank, was entirely overflowed, several barks carried up the country, many houses destroyed, and some people drowned; yet the creek was so far from being filled up, that the fishermen say, they find no difference in the bottom, which, thereabouts, is no less than 900 fathoms deep*. And in the beginning of the present century, something similar happened to a mountain in Julster, which falling into a lake occasioned an inundation, whereby the neighbourhood sustained great damages.

S E C T. X.

From these inconveniencies and disasters to which Norway and all mountainous countries are exposed, I proceed, on the other

* M. Hans Hiort, superintendant at Sundmoer, in his letter to me of the 30th of November 1750, is of opinion, that this was chiefly occasioned by the fluxions of water from a spring on the summit of the rock, through its clefts and fissures; and it being then a hard frost, the ice widened the clefts and forced them asunder. I close with this reason, and find it confirmed by Mr. Rohault, Princip. Traité Physique, Tom I. chap. xxiii. p. 201, "Si un corps dur a ses pores assez grands pour contenir beaucoup de liqueur, et si ces pores sont remplis d'eau, comme l'eau ne peut se geler sans se dilater, il peut arriver qu'en se gelant elle eclatera le corps qui la renferme?"

Conveniences and advantages arising from them to the inhabitants, according to the Creator's wise and bountiful design.

hand,

hand, according to promise, to recite the advantages of mountains; and these also are very many, and some very considerable, so that the kind Creator has universally, in some things, compensated the want of others, which he has thought fit to withhold from mankind.

The first benefit of mountains is, that they collect the clouds and dissolve them in rains, as I have already shewn; likewise that the masses of snow, reservoirs, and springs in the mountains, send down large and small currents of water, whereby the fields, woods, and cattle are refreshed, and even the subterraneous veins of water and springs, which do not immediately issue from without the mountains, owe their origin to them, especially where the veins are large and rapid, as has sufficiently been made out by Ray, Scheuchzer, Wolff, and other naturalists. I would only remark here, that several level heaths remain barren and uncultivated, merely because, after digging deep for springs, men can scarce procure water sufficient for their own use, and have no fodder for their cattle at all. I am also of opinion that mountain-water is more fertilizing than common rain-water, and whether from salt-petre effluvia, or some other cause, has in it a particular vegetative power, as is manifest not only from the quickness of the growth, and vigor of all kinds of young trees, particularly pines, ashes, oaks, and other trees on the sides of mountains, where is very little earth, and sometimes even in arid clefts, where they are known to thrive better than when planted in other parts; but the same is likewise visible in the cultivated parts, which indeed are small, but in such fecundity, as both in straw and grain greatly to surpass the champaign country, the marsh-lands and the like excepted. It is also well known, that the surface of the hard mountains, tho' unfit for the plough, affords large and excellent pasturages, and the property of the northern peasants in oxen, cows, sheep, and goats, would be reduced very low, were it not for their spacious range on the sides of the mountains; not to mention that wild-fowl, and beasts, do as well as the several hurtful animals find more refuge and food in the mountains, than in the level country. Besides, the mountainous countries may be considered as the store-houses or treasuries of providence, where are laid up, and from whence he kindly dispenses, according to the exigencies of the world in every age,

Mountains
the store-
houses of pro-
vidence.

those metals and minerals, which are become so indispensable in human life, and the want of which, as a medium in commerce, obliges some nations to exchange their commodities for a small bit of iron. Norway, till a century and a half ago, appears from all accounts to have wrought but few mines, consequently, the country contained treasures out of knowledge. Since that time, matters are so improved by the assistance of German miners, that the silver, copper, and iron mines, have produced to the amount of several millions. Olaus Magnus, would be agreeably surpris'd, if he were a witness of the increase of mines, both in his native country, and here, beyond what he had ever imagined; for in his time he could say, "*Montes excelsi sunt, sed pro majori parte steriles et aridi, in quibus nil aliud pro incolarum commoditate et conservatione gignitur, quam inexhausta pretiosorum metallorum ubertas, qua satis opulenti fertilesque sunt in omnibus vitæ necessariis, forsitan et superfluis aliunde, si libet, conquirendis, unanimique robore ac viribus, ubi vis contra hæc naturæ dona intentata fuerit, defendendis. Acre enim genus hominum est, &c.*" These last words, which may confirm the opinion, that the inhabitants of Sweden and Norway derive their natural vigour and bravery, from the proximity of these rocky mountains, remind me of the third advantage to be considered here; namely, that the mountains afford a shelter and defence, not only against the inclemencies of the weather, but likewise against invasions. They serve, as has already been said, for boundaries betwixt Norway and Sweden; for from Kolen, a long chain of mountains, of an amazing height, separates these two kingdoms. But the experience of all ages shews the many mountainous tracts in the country to be natural fortresses; for the Norway peasants, who are excellent marksmen, post themselves in time of war, on the steep inaccessible rocks, where, animated purely by a zeal for their country, they gall the enemy incredibly. Some provinces are also by nature utterly inaccessible to an army encumbered with artillery. On this account the city of Bergen, tho' fortified by no more than two castles towards the sea, is thought to be in no great danger, if threatned only by a land-force; for the peasants living in Justedale, and other places of the same kind, where the only passage is thro' a narrow defile, could, with a handful of men, keep

Olaus Magnus, in Hist. Sept. Præf. Lib. vi.

off a numerous army. Whether mountains be universally a natural girdle or band for strengthening the compages of the globe, as some conceive, I leave absolutely undetermined, it being immaterial to my purpose to adopt such conceits for my own*.

Pleasant
landscapes.

Lastly, these natural fortifications seem also to be an ornament and decoration to the country; the diversified figures, and alternate eminences, and other varieties, according to the taste of most people, form a much more agreeable landscape than a flat and even country, which is almost every where the same. In this respect our country affords the most delightful contrasts in the diversity of its prospects. And these most magnificent structures of the great architect of nature, raise and animate the mind of man, by inspiring him with the most agreeable and the most sublime sentiments. Towards the extremities of the sea-coast, those who sail along the bare rocks and towering mountains of Norway, will be apt to conclude, that the country can afford nothing but wretched cottages, and extreme penury; but this opinion soon vanishes upon their coming into the creeks, and observing that here, according to the German proverb, *there are people behind the mountains*, and that in the vallies and narrow interstices they live very agreeably, amidst such delightful landscapes, that within a few miles, a painter might have choice of incomparable originals. It is certain that nature has been more profusely favourable to the situation of some farm-houses, than to most royal palaces in other countries, tho' assisted with all the embellishments of groves, terrasses, cascades, canals, and the like. Some trading places, as Bragness and others, are charmingly situated betwixt the mountains at the mouth of the rivers. A predecessor of mine is said to have given the name of the northern Italy to the district of Waas, which lies some leagues eastward of Bergen; and certainly to one who desires no more than a regular assemblage of the beauties of nature (tho' of mere nature) there cannot be a more enchanting prospect; for all the buildings in it are Wang-church, the parsonage, and a few farm-houses scattered on different eminences. But the beauty of the prospect is much heightened by two uni-

* Quod ossa in microcosmo, hoc in geocosmo montium structura facit, qui totam terreni globi molem ita stringunt, ut dissolui minime possit atque hoc modo perfectam consistentiam consequatur. Athanas. Kircherus in Mundo Subterraneo, P. 1. pag. 67.

form

form mountains, gradually rising in the same proportions to a vast height, betwixt which runs a valley near half a league in breadth, and a river sometimes spreading into little lakes, and sometimes precipitating itself down the rocks, in foaming and sonorous cascades. On both sides it is bordered with the finest meadows, intermingled with little thickets; and the easy declivities of the verdant mountains covered with fruitful fields, and farm-houses standing above each other in a succession of natural terrasses. Between these a stately forest presents itself to the view, and beyond that, the summits of mountains covered with perpetual snow, and still beyond these, ten or twelve streams issuing from the snow-mountain, and forming an agreeable contrast in their meanders along the blooming sides of the mountain, till they lose themselves in the rivers beneath. In other places, especially Osterland, and even beyond Drontheim, in North-land, in the districts of Salten and Senien, there are likewise very pleasant spots, besides other advantages, which the inhabitants reap from the mountains, of which, to avoid prolixity, I now take my leave. But if any want further motives or informations on this head, to lead their meditations to God, as *the God of the mountains*, I refer them to the ivth chapter of Derham's *Physico Theology*.



CHAP. III.

Of the WATERS.

SECT. I. *The sea-coast, islands, and harbours of Norway.* SECT. II. *Bottom of the sea along the coasts.* SECT. III. *Bottomless depths even in the narrow streams and creeks which run up the country.* SECT. IV. *Weight of the sea-water.* SECT. V. *Its colour.* SECT. VI. *Its saltness.* SECT. VII. *Its fatness.* SECT. VIII. *Its coruscations, and brightness in the night.* SECT. IX. *Its agitations by winds, ebb, and flood.* SECT. X. *The Moskoe river in Nordland, is not what it appears to be at a distance.* SECT. XI. *Fresh-water, particularly springs, in Norway.* SECT. XII. *Rivulets, currents, rivers, fresh-water lakes, and floating islands in them.* SECT. XIII. *The great advantage of such waters for the conveyance and exportation of timber.* SECT. XIV. *Water-falls, or Cataracts, from the rocks into the rivers.* SECT. XV. *Bridges over the rivers, and the wonderful construction of some of them.* SECT. XVI. *Easy way of travelling in the winter over the frozen waters.*

SECT. I.

The coasts,
islands, and
harbours of
Norway.

I N our survey of the element of water, in and about Norway, the first object which presents itself to us is a part of the north or large Atlantic sea, which follows the coasts of Norway for three hundred leagues, and by many narrow channels forms a multitude of small and large islands, some of them being from three to six or nine leagues in length, and not barren; but most of them are so small, that they are inhabited only by some fishermen and pilots, who keep a few heads of cattle, which they send out for pasture to the nearest little islands, rocks, and Sheers. By such a rampart, which possibly may consist of a million or more of stone columns, founded in the bottom of the sea, the capitals whereof scarce rise higher than some fathoms above the waves, almost the whole western coast of Norway is defended; and thro' the providence of the wise Creator, there are many advantages which arise from them. Among these the first is, security against any naval power of an enemy, whose ships, without a pilot from the country itself, would not dare to venture within the Sheers, and then they are in danger from the least storm, which hereabouts gives no warning, insomuch, that in an instant, unless they have the good fortune of securing themselves in a good harbour, they may be dashed to pieces in the creeks, which are all inclosed

I

with

with steep rocks. This coast, indeed, affords so many and such good harbours as few other maritime countries can boast of; and this is another advantage of these numberless rocks and Sheers. Yet a large ship, which cannot make use of oars, will be in danger of not reaching the harbour, before the wind, or the current, which are very violent in the Straits, dash it against the steep rocks in the neighbourhood. In order to prevent this danger, several hundreds of large iron rings, have, by order of the government, especially here about Bergen, been fixed in the rocks more than two fathoms above water, as moorings to the ships, when there is not room for anchorage. The coasters find the advantage of so many Sheers and rocks, as these protect them in a calm water, against the violence of the waves, which is greatly abated by breaking against the rocks. On the other hand, a few open places, such as the harbour of the town, and that directly before Jeder, are so dangerous to pass, that many lives are lost there every year, the waves of the western ocean, when driven by a storm towards the land, making a very hollow and terrible entrance.

The bottom of the sea is here, as every where, full of inequalities, and in this respect, not less varied than the land, which is frequently an alternate succession of high mountains, and deep vallies. The analogy is the same in the substance of the bottom of the sea, according to the observation of pilots, from the end of their leads, where they sometimes find stones, sometimes clay, chalk, mud, and sometimes white or brown sand; and in many places it is over-run, not only with all kinds of sea-grass, but with several sorts of sea-trees, some of which are pretty large, with corals, and the like stony vegetables*. A clear view of these, and likewise of the incredible multitude of sea-animals, monsters, &c. most of them unknown, to which these vegetables partly serve as aliment, could not but excite in us the greatest astonishment; for from the sea-vegetables, which sometimes hang at the lines, or other implements of the fishermen, and of which I have a large collection, we must conclude, that the bottom of

Bottom of
sea.

* Sylvas esse submarinas mare rubrum sat superque docet, ex cujus fundo subinde ingens a piscatoribus corallarum arborum copia, ceraso nostro vix cedentium uti ab Arabibus rubri maris accolis non semel audivi, eruitur. Kircherus Mund. Subterr. P. I. pag. 97.

the sea, in its plains, mountains, and vallies, has forests of different kinds of trees, which, from the size of some branches which have been drawn up, may be conceived at least equal to the largest fruit-trees in our gardens; but I reserve my own observations upon these, till I come to treat in their order, of the Norway plants and vegetables.

S E C T. II.

Bottom of the
sea along the
coast.

The Norway shore is in very few places level, or gradually ascending, but generally steep, angular, and impendent, so that close to the rocks the sea is a hundred, two hundred, nay, three hundred fathoms deep; whereas, on the long and uneven sand-banks, which are generally called Storeg, or by others Haubroe, sea-breaks, the bottom is much more sloping. These protuberances run north and south along the coast of Norway, like the Sheers, tho' not within them; in some places they are but four or six leagues, in others twelve or sixteen from the continent, that from thence it may be concluded, that the bays are formed by them. These Storegs are another disposition of the wise Creator, from the abundant fisheries they afford, like the Dogger-bank betwixt Jutland and England; in a bottomless deep the fish would be out of reach, but here is as it were their daily rendezvous, and the depth being from ten to fifteen fathoms, they are taken with great ease.

S E C T. III.

Unfathom-
able depths,
even in the
rivers and
creeks.

From the sea, particularly on the west-side of Norway, several large and small creeks run six, eight, or ten leagues up the country; in these the bottom is found to be very different, tho' in general as deep as that of the sea without; but as to the depth under water, the peasants pretend, that the nearest steep mountains are the measure by which to judge, they corresponding in their height above water, with the depth of the sea: Whether this rule be exactly right I shall not determine*. This, however, is certain from general experience, that in the middle of these westerly creeks, runs another narrow channel of a quite disproportionate depth, which therefore is called Dybrende, i. e. the deep courses; the breadth

* This is confirmed by experience in many other countries. Dampier's Voyages, P. II. p. 476.

is from fifty to a hundred fathoms; but all the fishermen agree, that the depth is seldom less than four hundred fathoms, and they are very careful in spreading their nets, to cast them as near this deep channel as possible, for the fish are caught in the greatest plenty on its banks, it being as it were a place of their daily resort; but herein they are obliged to use no less caution, that their nets be not carried into these depths, for the current, on account of its narrowness being very rapid, they are hardly recoverable; and, besides, their line and nets will not suffice for a gulph of three or four hundred fathoms. The depth of the water on both sides of this channel, is commonly about an hundred fathoms, to which, if according to the above-mentioned rule, the height of the steep rocks on the sides be added, tho' many of them are twice or three times higher, the whole space from the crest of the mountains to the bottom of these narrow depths, is at least five hundred fathoms, or fifteen hundred ells. This great depth appears to me very worthy of observation, to those who would investigate the effects of the general deluge, these deep creeks, and other deep vallies, being, as I conceive, formed by the ebb of the waters, in the substance of the rocks, which has been shewn to have been soft and impressible, as a paste, or a mass of mud, which gradually subsided and became a solid bottom to the waters, through which the large streams and floods in their impetuous ebb must have made an incision, more or less deep, according to the height of the place from whence they issued. Now if it be considered, that the long chain of high and extensive mountains, reaching, north and south, the length of fifty Norway miles from the middle of the diocese of Christianland to Dofrefield, is about sixteen Norway miles from the furthest sea-coast, likewise that all the western creeks run across from the root of that chain into the sea; we shall conclude, that the great depth of the creeks is little to be wondered at, the places, from whence the last waters fell, being of such an enormous height, consequently the many waterfalls, which gradually depressed the eminences, and the edges of the sides of the mountains, must have been of extreme rapidity, and strong enough to occasion these deep channels. The benefits of them are such, that to them the diocese of Bergen may be said to owe its being habitable, and the communication it enjoys.

joys with the sea. For the many insurmountable rocks and precipices, the roots of which are penetrated by these navigable creeks, would else have rendered it impossible to dwell any where but on the sea-coasts, many tracts on this account being wild and uninhabited, in the mountains of Tyrol; and divers parts of this diocese, distinguished by the name of Uddale, i. e. inaccessible vallies, are, for want of communication with other countries, either without inhabitants, or they are destitute of conveniencies, tho' here and there in no want of fuel and pasture. Concerning this depth of the sea, I must further add, that in some places no bottom can be found, as in Floge creek, a Norway mile from Drontheim, where, after measuring it with a line of a thousand fathoms, the search proved fruitless, so that unquestionably the bottom of the sea has an opening or communication with this immeasurable abyfs.

S E C T. IV.

Weight of the
sea-water.

Altho' the sea-water, towards the north, contains less salt, than that near the line, as shall hereafter be shewed, yet its weight is much greater than in the warm countries, the cause of which is by Isaac Peyrere, in his letter concerning islands, to M. de la Mothe le Vayer, attributed to the aqueous particles, which are here more dense and impure than elsewhere. But as this creates another inquiry, he might more pertinently have said, that the air near the poles being condensed by the cold, compresses close whatever it touches, and consequently the particles of the water, and as by this compression they adhere closer to each other, consequently they have force to bear up heavy burdens, which in lighter waters would sink.

Rohault
Traité de
Physique,
Tom. II. p.
III. cap. III.
§ 9.

S E C T. V.

Its colour.

According to the observation of Mr. Urban Hiernes, the water of the north-sea is of a bluish tinge, as that near the Green Cape and Florida partakes of the colour of the sea-grass, which grows in great abundance thereabouts; near Vera Cruz it is white, from the chalky bottom, and near Maldivia it is as black as ink, probably by reason of the effluvia from the coal-mines, or some other black substance at the bottom. But that the water of the north-sea, has in itself a blue tinge does not appear, and I am

inclined to believe that this blueness is no further real, than as the eye is apt to represent to itself the air, or any object at a great distance, of that colour. Peyrere, in the place before cited, affirms, that the ice in the north-sea is blue, and therefore by the ancients termed *Cerulea Glacies*. The snow, which on the summits of the mountains gradually hardens into ice, is of this colour, and therefore commonly called *Blaabreen*.

S E C T. VI.

Altho' the sea-waters of Norway be much saltier than those of Its softness. the Baltic, where the sea is refreshed by abundance of rivers running into it, yet it has not the saltiness of that in warmer countries, especially under the torrid zone. And this is no more than Lowthorp. Abridgm.vol. 11. p. 297. natural; for where the vehement heat of the sun occasions a more copious evaporation and exhalation, as in the salt-pans, there the saline particles in the remaining water become the more closely united, and consequently the saltiness of it more pungent; for that the sun itself should convey in its scorching rays innumerable atoms of salt to the sea, and consequently most there, where it strikes the greatest heat, is contrary to all experience, altho' the long since rejected principle of Aristotle * is again discussed and espoused by that very ingenious and diligent naturalist in Sweden, In the above-mentioned work, p. 83. Mr. Urban Hierne. It seems of more importance here to enquire, why the saltiness of the sea-water, here decreasing towards the north, increases at some distance higher towards the north-pole, so that the water, no further than Iceland, is saltier than the water on our Norway coasts, according to M. Anderson's remark in his Description of Iceland? The cause is plainly this, that a very intense cold, sublimates by evaporations greater quantities of the superficial and freshest sea-water, and partly dissipates them by frost. Thus here the cold has, tho' in a less degree, almost the same effect as the heat in hot countries; but this effect it cannot produce on the west-coast of Norway, where, for the most part we have damp weather, and know very little of the clear cold

* Je dirai ici en passant, que c'est un erreur d'affirer avec Aristote, que la salure de la mer depend de ce que les eaux sont brulées par les rayons du soleil, car l'on n'a jamais experimenté que la chaleur de cet astre, ou meme celle de la flamme ait converti de l'eau douce en de l'eau salee. Rohault Physique, T. II. p. 111. cap. iv. Sect. 34.

Fresh springs
in the bottom
of the sea.

Salt pans.

of winter, as I have shewn in the first chapter, together with the causes of it. Further, that the sea-salt dissolves and detaches itself from the adjacent salt-grounds, and, partly, is carried thither by subterraneous currents, running thro' the deep salt-mines; of which kind some are to be found in Poland, and other parts, seems to me preferable to any other opinion, although the sagacious Baron Wolfe cannot entirely come into it. But what I alledge in answer to the question, why the sea-water does not continually grow salter, is this; that exclusive of the immense quantity of salt, which the sea daily loses by the many salt-works in France, Spain, and other countries, exclusive of the rain, and the fresh-water rivers discharging themselves into the sea, by which, according to the disposition of the wise Creator, the balance is continually maintained; exclusive of all this, it is highly credible, that fresh-water springs issue out of the bottom of the sea. The possibility of this admits of no doubt; but to demonstrate the reality by any experiment, will be attended with some difficulty, yet the fishermen living under Sund-moer, have more than once informed me, that they often find, in the body of a skate, water entirely fresh; which must always be such, if this freshness be the result of a kind of filtration, which the water has undergone within the body of the fish; but this freshness not being common, I conclude that the fish has drank in this fresh-water from a spring breaking out in the bottom of the sea. It is observable, by the way, that the sea-water on the coast of Norway, but mostly on the west-side, is known to be pretty full of salt particles, the peasants finding no small quantities of salt in the clefts and apertures of the rocks, where, by the egress and regress of the water, some salt is left with the remaining surf, such as might on occasion be collected and purified. In Hardanger, on Nord-moer, and several other places, particularly in the diocese of Drontheim, the peasants extract salt from the sea-water by boiling; but as this operation is forced, and consumes great quantities of wood, therefore the law of Norway prohibits the boiling any more salt than is necessary to every one for his domestic uses, without the express permission of the magistracy to make that use of the fuel. About ten years ago, a large salt-work was begun at Tonsberg on the king's account, and the sea-water, after being first refined, is there boiled in such quantities, that
several

Several ship-loads are annually exported; tho' this is but a small matter in comparison with sixty, or more, fine large ships laden with salt, which come every year from Spain and France, for the fishery and other uses.

S E C T. VII.

Next to its saltness, the oil, or fatness, or unctuousness of the north-sea, is a remarkable property of it, especially as the innumerable shoals of large and small fish, which are both ingendered and nourished there, serve both for food, and for the benefit of light, to almost all countries in Europe. For it is not merely by devouring one another that the fish are fattened, or by the aliment they receive from an infinite number of worms, and other insects, likewise sea-grass, sea-trees, and such vegetables, which are the food appropriated to particular kinds of the inhabitants of the sea; the salt-water itself, is from its saltness so fat and oily, that when a ship is on fire, the sea-water, so far from extinguishing, encreases the flame. The Chemists know how to extract oil from salt, and Aristotle says, *Quoniam mari suum pingue est, quod oleum demonstrat quod in sale est.* Besides this, in many places the bottom of the sea is covered with a kind of unctuous loam, or slime, which, unquestionably, is formed from the superfluous roes and spawn of the fish, which cannot all produce young, nor can they be all consumed by the other fish whilst they are fresh, altho' they hunt for it with the greatest eagerness. It is moreover not improbable, that small springs or currents of rock-oil, naphtha, sulphur, or pinguous effluvia of coals, and other slimy and oleaginous juices, may arise in the sea as well as the earth.

The sea-water oily.

Arist. Probl. § xxiii. Qu. 32.

S E C T. VIII.

This unctuousness of the sea has probably some connection with its effulgence and scintillations, when the water being stirred by rowing, or otherwise, appears all on fire, which by our mariners is called Moorild. I have already in the first chapter, in treating of the Aurora Borealis, or north-light, taken occasion to quote Captain Heitman's opinion concerning this phenomenon, and shall only observe here, that Mr. Urban Hierne, the Swedish naturalist, who in a passage before cited, derives the sea-salt from the sun, judges

Nocturnal coruscations and effulgence of the sea.

judges this sea-light to be a kind of phosphorus, formed from the luminous particles of the sun, and even of the moon, impregnated by water; as is the case in the Lapis Bononiensis, and Baldwin's phosphorus. But instead of resting in these, or other conjectures, I am much more inclined to declare my opinion, that this otherwise inexplicable phenomenon in the sea, has been best illustrated (tho' with room for many additions) by a little piece lately published at Venice, with the title of *Nuovo Scoperto Intorno di luci Notturme dell' Aqua Marina*. Having no opportunity of seeing the original, I am the more obliged to the diligent and ingenious authors of the *New Copenhagen Literary Journal*, who have given us the substance of it in the xxxixth part, of the 24th of Sept. 1750, in the following words, "Our author is the first who has explained the true cause of this coruscation: He has observed, that in the gulph of Venice, the water is luminous only from the beginning of summer till the end of harvest, and that this light is most copious in places abounding with sea-grass; and still more when the water is put in motion, either by the winds, ships, or oars. In 1746, the author filled a flask with this scintillating water, and carried it home; but it emitted no light, except only when stirred in the dark, it immediately sparkled. He closely inspected it in the day-time, in order to discern whether the water had any thing heterogeneous in it, from whence these emanations of light proceeded; but nothing of this kind appeared to the naked eye: he therefore strained the water through a close fine cloth, the consequence of which was, that the cloth shone in the dark, but not the water, however shaken or stirred. This inclined him to judge, that the lucid substance in the water was something distinct from the water itself, especially as he perceived the light, which the cloth emitted, to consist of innumerable lucid particles or points; but not having a microscope at hand, he could take no minute view of them. Having some time after procured a microscope, he gathered some sea-grass, which is most apt to glitter in the night, and upon examining it in a dark place, he discerned above thirty of these lucid particles on one single leaf. He shook this grass over a sheet of paper, when one of these particles fell off; it was as subtile as an eye-lash, and about as long, and the colour a black yellow: he now made use of the micro-

scope, and plainly saw it to be a living worm, or annular maggot, consisting of eleven wings, like most of the larvæ, with as many mamillæ on the sides instead of feet, and both at the head and rump, four trunks or feelers (antennæ or tentacula.) In the prosecution of his researches, he found that all these lucid appearances in the water, arose from these minute and almost invisible maggots; their whole bodies were lucid, and not some particular part only, which is the case of some kinds of reptiles; tho', when at rest, their effulgence was considerably fainter. In spring these luminous animalcula confine themselves to the sea-grass, but in summer they are dispersed all over the sea, and mostly on the surface. When these nocturnal scintillations are unusually strong and frequent, the fishermen account it a sure prognostic of a storm, or foul weather; and this proceeds from the greater agitation of the worms, already sensible of the approaching changes. This experiment puts it beyond all question, that the glittering of the sea, in a ship's course, is occasioned by these worms; and it is no less certain, that they are the cause of the light in the Penna-marina, (a large muscle) of which Dr. Shaw writes, that they are frequently caught by the Algerine fishermen; and in the night their radiations are so strong, that the fish nearest to them in the net are discernible without any other light. It were to be wished, that the author had been more precise in his description of these animalcula; if his eyes may be relied on, one cannot but judge, that they are only a species of the Genus *Aphroditæ*." Thus far this author; to which all my present addition shall be this; the *Ignes lambentes*, or lambent flames, so well known, which by their hovering about the ships rigging, and often settling on the masts, tho' without doing any damage, strike a terror into the seamen; and likewise those *Ignes fatui*, or jack-a-lanterns, which deceive the traveller by land, must, according to this principle, be no more than worms, bred in the above-mentioned sulphureous oil, with which both land and sea is filled, but which is too subtle to be discerned by day, when even the light of the stars is seemingly invisible.

S E C T. IX.

Motion of the
sea by cur-
rents, ebb, and
flood.

My subject brings me at last to the several motions of the water in Norway, by the ebb and flood, and by other perpetual currents; the motion of the sea by winds, or by the impulse of the corpuscles of the air, having already in some measure been considered in the first chapter. The motion of the sea is generally from east to west, tho' it be not always apparently so to us; for the earth revolving round its axis with a constant rapidity, and in an opposite direction from west to east, and the water as a more lax element, not being capable of equal velocity, but somewhat slower in its progression, the surface thereof seems to be in a contrary and retrograde motion. The motion of the water is in some measure influenced by the sun, but not to such a degree here as in the warmer countries; where its rays being more perpendicular, act with the greater force*.

Another motion in the sea is interrupted, and mixes with the general stream, occasioning the water alternately to rise and fall within the twenty-four hours, when the flood proceeds from the east, and the ebb from the west, and these alternatives fall out regularly according to the course of the moon, so that they are very little varied by the shifting of the winds. The greatest height of the flood here is eight feet, but much more usually from four to six, which is far short of the height in the Netherlands, and England, the water being checked in the strait betwixt Calais and Dover, but having more room to extend itself in the north-sea†. That this motion, in other respects one of the greatest mysteries in nature, is, as to its original cause dependent on the moon, cannot well be controverted: But whence this influence of the celestial bodies on the waters of our globe; whether, according to the sentiment of the ancients, the rays of the moon leave the sea im-

Hartf. Conj.
Phyiq. L. 1.
Disc. I. p. 52.

* The current in some places is remarkably strong and impetuous, as where it is extremely straitened and confined at the bottom by ledges of sheers, rocks, or sand-banks, at a small distance from the shore; and being thus contracted into a narrow channel, is so difficult to stem, that a boat must either be drawn along by hands on shore, or wait some time till the current abates.

† Mr. Lucas Debes, in his description of the island of Faro, relates something strange of a freshwater-lake near Famoye, a town on a hill of a middling height, that it regularly keeps time with the ebbing and flowing of the sea. As the impression of the moon upon our atmosphere cannot be stronger on this fresh lake than on others, this must be supposed to have a subterraneous communication with the sea, through some vast and extraordinary hiatus.

preg-

pregnated with an intumescent or fermenting power, by which it begins to work alternately, with different forces, like new liquor in a cask; or whether Descartes comes nearer the truth, in advancing, that it is only the atmosphere of the moon, which makes an impression on all sublunary bodies (of which patients in certain diseases have very sensible experience) but most on the sea, where, accordingly the impression is most observable: this must, as it has hitherto been, remain a difficult problem *, even to our inquisitive age. And, indeed, there is no absolute necessity that our great Master should in this life admit us, as his scholars, and the most knowing are but novices, into all the arrangements and operations of his almighty power and inscrutable wisdom. I rather think it were best to rest in a devout admiration of these things, than to subject them to an arrogant and presumptuous decision.

S E C T. X.

There is another kind of current, or motion of the water in the sea of Norway, remarkable, and somewhat relative to the ebb and flood, namely the *Malestrom*, or *Moskoestrom*, in the 68th degree, in the province of Nordland, and the district of Lofoden, and near the island Moskoe, from which the current takes its name. Its violence and roarings exceed those of a cataract, being

The Moskoe-
strom not
what it is ta-
ken for at a
distance.

* "Le fluide pesant et elastique, dont notre terre est environnée, doit comme tous les liquides, s'élever ou s'abaisser dans les endroits, où des causes étrangères détruisent l'équilibre, d'où viennent, dans les tems réglés, des changements dans la pression de l'air. Le flux et reflux admiré de tout tems, mais inexplicable avant Newton nous fournit la résolution de ce problème. Nous voyons cette grande masse d'eau s'élever deux fois toutes les vingt-quatre heures, dans le tems que la lune est ou directement au dessus de nous, ou dans le point opposé. Notre air, par la même raison, et dans le même tems doit aussi changer sa figure sphérique en celle d'un sphéroïde allongé dont le grand diamètre passe par la lune. Le soleil, qui de même qu'elle traverse tous les jours deux fois, notre méridien, produiroit le même effet, si sa distance plus grande ne mettoit entre son action et celle de la lune le rapport de 1 à 4 $\frac{1}{2}$. Le concours de ces deux astres dans les tems de la pleine et de la nouvelle lune augmente les elevations de la mer, et doit augmenter de même les marées invisibles de l'air, et elles doivent être plus petites dans les quadratures, lorsque les actions des deux luminaires sont opposées entre elles. Elles sont d'ailleurs proportionnées à leur distance plus ou moins grande de la terre. Et les déclinaisons de la lune dans de certains lieux rendent tous les jours l'une des deux marées, tant dans l'air que dans la mer plus grande que l'autre." *Biblioth. Raisonnée de l'an 1746, T. xxxvii. p. 299, 300.* This extract from Dr. Mead's treatise, *De Imperio Solis ac Lunæ in Corpora Humana, &c.* is the most apposite of any, and I can confirm it by the instance of a lady but lately dead at Bergen, the calves of whose legs, in the time of her pregnancy, so punctually swelled and abated with the efflux and reflux of the sea, that the time of tide could be determined without looking towards the sea.

heard

In Mundo
Subterr. C. x.
Lib. iii. p.
17.

Nordisch
Chorograph.
p. 233, 234.

heard to a great distance, and without any intermission, except a quarter every sixth hour, that is, at the turn of high and low water, when its impetuosity seems at a stand, which short interval is the only time the fishermen can venture in: but this motion soon returns, and, however calm the sea may be, gradually increases with such a draught and vortex as absorb whatever comes within their sphere of action, and keep it under water for some hours, when the fragments, shivered by the rocks, appear again. This circumstance, among others, makes strongly against Kircher and others, who imagine that there is here an abyss penetrating the globe, and issuing in some very remote parts, which Kircher is so particular as to assign, for he names the gulf of Bothnia. But after the most exact researches which the circumstances will admit, this is but a conjecture without foundation; for this and three other vortices among the Ferroe islands, but smaller, have no other cause, than the collision of waves rising and falling, at the flux and reflux, against a ridge of rocks and shelves, which confine the water so that it precipitates itself like a cataract; and thus the higher the flood rises, the deeper must the fall be; and the natural result of this is a whirlpool, or vortex, the prodigious suction whereof, is sufficiently known by lesser experiments. But what has been thus absorbed, remains no longer at the bottom than the ebb lasts; for the suction then ceases, and the flood removes all attraction, and permits whatever had been sunk, to make its appearance again. Of the situation of this amazing Moskoeftrom we have the following account from Mr. Jonas Ramus, "The mountain of Helsinggen, in Lofoden, lies a league from the island Ver, and betwixt these two, runs that large and dreadful stream called Moskoeftrom, from the island Moskoe, which is in the middle of it, together with several circumjacent isles, as Ambaaren, half a quarter of a league northward, Ifesen, Hoeyholm, Kieldholm, Suarven, and Buckholm. Moskoe lies about half a quarter of a mile south of the island of Ver, and betwixt them these small islands, Otterholm, Flimen, Sandflesen, Skarholm. Betwixt Lofoden and Moskoe, the depth of the water is between thirty-six and forty fathoms, but on the other side, towards Ver, the depth decreases so as not to afford a convenient passage for a vessel, without the risk of splitting

ting on the rocks, which happens even in the calmest weather : when it is flood, the stream runs up the country betwixt Lofoden and Moskoe, with a boisterous rapidity, but the roar of its impetuous ebb to the sea, is scarce equalled by the loudest and most dreadful cataracts ; the noise being heard several leagues off, and the vortices or pits are of such an extent and depth, that if a ship comes within its attraction, it is inevitably absorbed and carried down to the bottom, and there beat to pieces against the rocks ; and when the water relaxes, the fragments thereof are thrown up again. But these intervals of tranquillity are only at the turn of the ebb and flood, in calm weather, and last but a quarter of an hour, its violence gradually returning. When the stream is most boisterous, and its fury heightened by a storm, it is dangerous to come within a Norway mile of it, boats, ships, and yachts having been carried away, by not guarding against it before they were within its reach. It likewise happens frequently, that whales come too near the stream, and are overpowered by its violence ; and then it is impossible to describe their howlings and bellowings in their fruitless struggles to disengage themselves. A bear once attempting to swim from Lofoden to Moskoe, with a design of preying upon the sheep at pasture in the island, afforded the like spectacle to the people ; the stream caught him, and bore him down, whilst he roared terribly, so as to be heard on shore. Large stocks of firs and pine-trees, after being absorbed by the current, rise again, broken and torn to such a degree, as if bristles grew on them. This plainly shews the bottom to consist of craggy rocks, among which they are whirled to and fro. This stream is regulated by the flux and reflux of the sea ; it being constantly high and low water every six hours. In the year 1645, early in the morning of Sexagesima-Sunday, it raged with such noise and impetuosity, that on the island of Moskoe, the very stones of the houses fell to the ground." So far Mr. Ramus, whose account perfectly agrees with those given me by others, especially Mr. J. Althand of Ethne, who in his younger years was chaplain there, and consequently had many opportunities of observing variety of circumstances. Mr. Peder Dafs, who lives on the very spot, will admit of no other cause of this natural prodigy ; and in contradiction to the opinion of the Danish poet Arreboe, in his stanzas on subterraneous watery abysses, he

affirms this vortex to arise only from the violence and rapidity of the daily ebb and flood, occasioned by the contraction of its course betwixt the rocks, whereby, in calm weather, but much more when the sea is roused by the wind, this Moskoestrom is rendered so dangerous and dreadful, both on account of its sound, and the furious agitation of its mountainous waves.

The like vortices in Ferroe.
Ferroe Referrata, cap. i.
p. 45.

For the illustration of this strange phenomenon, I shall add a description of three vortices, equally rapid, but not bottomless, here in the north-sea, near the island of Ferroe: What the late Rev. Mr. Lucas Debes, superintendant there writes of them, deserves to be read in his own words: "In Ferro are three whirlpools, one betwixt the islands of Vider, Suine, and Bord, but here is no great danger: the second is off the island of Sand, near Dalsflaes; it is distinguished by the appellation Quærne, i. e. mill-wheel, and in blowing weather, or a high tide, is dangerous; but the greatest danger lies in the third, which is southward of the Suder island, and runs round Sumboe-munk. These, and the like whirlpools, are not occasioned by any extraordinary abyss, or subterraneous cavities, into which the water is violently attracted in the time of ebb, and again ejected at the time of flood; as some imagine the flux and reflux, over the whole ocean, to result from the like causes; for if this were the case, it would not be attended with such a terrible sound, a deep bottom making a still water; but the real cause lies in the convexity of the bottom, intersected with canals or trenches.

I have made the most diligent research into these whirlpools, having been sent from Ferroe with two persons, deputed with public powers, to negotiate some provincial matters; and, on this occasion, one of them, John Joensen, an inhabitant of Suderoe, informed me, that he was the first, who ventured in a row-boat on the southern whirlpool, which runs from Suderoe round Sumboe-munk, and from his own certain and long experience, gave me the following account: This stream, is in itself very dreadful and dangerous, especially in a storm or strong tide, it absorbs every thing near it, and immediately plunges it to the bottom, insomuch that a large ship, within its draught, is infallibly swallowed up. It is but a few years since the above-mentioned John Joensen, about Christmas, saw a large ship driven into this stream by a storm,

first

first it mounted with its prow foremost, then was reverted with its stern uppermost, the surf flying over the mast head; but in a very short time he saw no more of it. That expert navigator Bagge Vandel, makes mention of this vortex, adding in particular concerning Peter Oddevald, master of a vessel, that both he and the ship's company informed him, that the ship was tossed about in it before he had any sense of the danger, and instantly he lost all power of steering her; that the water broke on all sides into the ship, flying up to the mast head; that the sails were of no service to extricate him, the weather being quite calm. To which the master added, that he had never before been in any danger like it; but that at last God was pleased to help him, and that by the turn of the tide he got without the draught, and arrived safely at Thorshaven, the place of his destination.

But, according to the report of the said John Joensen, the bottom, near this vortex, lies about eighty or ninety fathoms deep, over which the stream runs smooth and silent; after this is another circle, compassing the vortex, at the depth of from twenty-five to thirty, or thirty-five fathoms, and here the sea, fermented by the stream, begins to be agitated, to attract, and whirl round; afterwards the bottom rises so as to be but eight, ten, or twelve fathoms deep, and rises in a winding circle, which increases gradually in four spiral windings: on this shallow ground, are likewise protuberances like the crests on mountains, not more than eight fathoms deep from the surface of the water, whereas, the space between is from ten to twelve fathoms deep; and hence it is, that fishing-boats which come into this unequal bottom, are, by the stream circulating round these rocks, whirled about like a mill-stone, with such rapidity, that young persons who are not used to the whirling, grow giddy, and lay themselves down in the bottom of the boat; and besides this motion, the boat likewise undergoes a rotation round the large spiral circle, formed by the nature of the bottom.

In the third place, there are betwixt these four spiral shallows, three canals, or trenches, where the sea moves gently round in small circles, and beyond them, eastward, where the shallows commence, is a draught like a sluice, thro' which the stream is carried, tho', within, its force and agitations are not so violent.

The depth of these canals is from twenty-five to thirty and thirty-five fathoms; and from the disparity of the depths, and the easy whirling of the water in them, the bottom appears to resemble the land, that is, to consist of eminences and vallies.

Fourthly, in the middle of this vortex is a deep pit, which on its banks measures from fifty to fifty-eight fathoms deep; but in its middle is generally not less than sixty-one. This innermost water is on its surface perfectly calm and smooth, only moving in a gentle circle, as is manifest from the foam of the sea; which, on its devolution from the vortex, moves in a circle. On the south side of this pit, a rock, ten fathom high, rises out of the water; it is called Sumboe-munk, and here the depth of the water is but fifteen fathoms. North of this rock lie six sheers, betwixt which, and the rock, the depth of water is three or four fathoms. And what is very remarkable (and which I have accordingly taken notice of elsewhere) among these sheers the compass turns round, in the manner of the vortex, and is spoilt by the motion. Likewise, at some height on Sumboe-munk, there is this singularity, that in the midst of summer, and in a strong sunshine, the people who go thither to catch birds, can hardly stand in their ambuscades for cold; besides, the very birds which breed and live there, are so extremely bare of flesh, that their whole substance is little more than their feathers; but of the cause of this singular cold, I can only form uncertain conjectures. The water about Ferroe, however essentially cold, yet by its saltness and agitation, usually attemperates the winter's severity in Ferroe; I cannot therefore comprehend, how the frequent agitations of this stream against the rock, should by an effect quite opposite, occasion such an extraordinary cold. It might, by way of a solution, be said, that there being a magnetic power in these sheers, as the centre of these round shallows, there must in the other round shallows be a strong magnet, which, besides the force of the current, rapidly draws large ships from their course; and if it be granted, that such magnets are there, then I submit it to the judgment of others, whether the cause of this singular cold is to be sought for in these magnetic powers.

Fifthly, north of the vortex, towards the Suder island, there are other protuberances in the bottom, against which the current

is in like manner impelled, and the agitation attended with a very dreadful noise. A clear idea of what is described in the foregoing account cannot be perfectly conveyed by a description. The judicious reader will readily conceive, what a perilous place such a vortex must be in a hard gale of wind, and a full tide; since even in a calm, when the current is most gentle, and at the turn of the tide, which is the only time fishermen can venture out, the boats are whirled round on the surface of it.

The whirlpool, below the isle of Sand, continues circulating to its innermost centre, and is of no great depth in the middle. The third whirlpool, betwixt the northward islands, I have visited twice myself; and upon approaching it, the boat was attracted towards it, with such force, that it was with great difficulty the people prevented the stream from getting the better of us, labouring at the oars on one side, and steering with them on the other. If a boat be caught by the stream, the current first whirls it twice round, and then twice round in a contrary direction, this alternative continuing four or five times; from which the nature of the bottom becomes easily determinable.

These abysses have engaged the attention of many ingenious heads, the depth of the waters being such, that no one could, for a long time, venture to sound the bottom, so that the general opinion among the learned was, that they were gulphs, or abysses, such as caused the ebb and flood. Among others, Kircher writes of the famous vortex in Norway, called Moskoeftrom, that it is a sea-vortex, attracting the flood under the shore of Norway, where, thro' another abyss, it is discharged into the gulph of Bothnia; which opinion is embraced by M. Herbin, in a dissertation delivered by him at Copenhagen, 1670. But as this opinion is only founded in weak reports, it is totally erroneous, as will appear from the following arguments. First, this Moskoeftrom runs along the country, betwixt two shores, or islands, where the bottom, or ground of the sea, is full of eminences, and without any pits. Of the like nature also are all the vortices, both in Ferroe and in Bothnia. Kircher likewise affirms, that many such abysses are to be found throughout the whole world; but always near the continent, or betwixt small islands. Such is the situation of Scylla and Charybdis, in the sea of Sicily, the one be-

Lib. iii. Hydrog.

In Tabula Geographico-Hydrographica.

low Sicily, and the other at the point of Calabria; and for the greater confirmation of this matter, Kircher mentions a high rock standing out in the middle of this current, like the rock before described, in the vortex called Sumboe; and certainly these high rocks, in the midst of such perilous streams, are no other than natural marks set up by God himself, that navigators, having timely notice, may avoid the danger.

Next, Mr. Peter Clauffon, in his description of Norway, writes, that the gyration of the water is attended with such roaring agitations as to be heard many miles off. This would not be the case were this vortex occasioned by the extraordinary profundity of the bottom; for it is deepest in still waters; but these roarings proceed from the water being retarded, by its contraction betwixt two islands, in its progress towards the land at the time of flood, and likewise in its regress thro' the same narrow passage at ebb; and, moreover, the flood is obstructed by spiral hills, or protuberances, and lofty angular rocks; from whence it is natural to conclude, that such violent collisions must cause a terrible noise. Thirdly, Mr. Clauffon writes, that this stream absorbs whole trees, and after submerging them, they come up again with their roots and branches stript and torn, which is occasioned by these round and angular rocks, which in the rapid gyrations of the trees round them, strip the bark, and tear the roots and branches; and many of these mangled trees are driven to Ferroe, whereas in an abyss, they would be carried another way; for then the cavity would be large and deep, and the water circulate gently, and whatever was absorbed would pass through the abyss without any damage; as may be seen from the plain instance of a piece of wood put into a funnel, afterwards filled with water." Thus far Mr. Debes.

It is evident, from the premises, that some ancient and foreign writers, who could not minutely examine the circumstances, mistook these vortices as the cause of the ebb and flood; of which they are, on the contrary, in reality the effect. I must not omit here, that Mr. Jonas Ramus, in the above-mentioned place, page 220, &c. labours to shew it probable, that Scylla and Charybdis, which have always been accounted to lie upon the coast of Sicily, were no other than this Moskoestrom, whither Ulysses was
actually

actually driven in the course of his wanderings; the inundations of the water (in the Danish language, Vanders Skyllen) and the island Skarholm, having given occasion to the names of Scylla and Charybdis. Though I can by no means agree to the opinion of this ingenious Gentleman, concerning Ulysses's voyage, yet, in proving the probability of it in another learned piece, it must be confessed, that he has given proofs of an uncommon erudition and genius, and as to the Moskoeftrom, I shall exhibit his opinion in his own words, that then the reader may adopt as much and as little of it as he pleases.

Singular opinion concerning the situation of Scylla and Charybdis.

“Halogaland appears to be one of the first inhabited provinces in Norway; for soon after the Trojan war, Ulysses, whose name was Outin, sailing to the extreme limits of the great ocean, arrived in a dark country, of which he gives the following description; it was full of high mountains, reaching to the very clouds, and perpetually covered with mists and thick darkness, so that they never enjoyed the benefit of the sun, neither at its rising nor setting, and there he met with two horrible sea-vortices, Scylla and Charybdis, the noise of which struck him with terror, before he came near them; and then he saw a violent ebullition of the sea, like a boiling-kettle, throwing up froth and smoke, which were rapidly carried up in the air. All this has by many been falsely interpreted of the strait near Sicily, though that island has none of those high mountains, covered with dark clouds, nor that gloominess impenetrable to the rays of the sun, nor a perillous roaring stream, so as to be impassable without extreme danger. But all this perfectly coincides with Moskoeftrom, near Helleland, where there are, on the side of Lofode, those high mountains called Helseggen, the summits of which, according to Homer's description, were inaccessible to any man, tho' he had twenty hands and feet, and in winter involved in continual mists and darkness; for from the 27th of November to the 25th of December, old stile, the sun is never seen there. There, likewise, are those terrible ebullitions, and horrible sounds, which so terrified Ulysses at Scylla and Charybdis; circumstances quite similar to the roaring fall betwixt Helseggen and Moskoe, where the stream overflows the intermediate rocks and islands, and thus came to be called Scilla, from Skillers; and on the other side of

Moskoe, are also islands and rocks, against which the stream breaks, among these, particularly, is the island Skarholm, which may be taken for Charybdis.

The ancient geographers are known to have had some information of sea-vortices in the north, and according to their opinion, lying under the north-pole, as Jacobus Cnoxen of Buscodun, in his *Itinerarium*, and Mercator in his *Atlas*, pretend, whose opinions also Bertius has followed, and given a representation of some sea-abysses under the north-pole, together with an island, which he calls *Ruft*; but as we are now sensible that there is no going within several degrees of the north-pole, on account of the extreme cold, and of the ice-mountains; therefore this sea-abyss, of which they had heard, can be no other than this *Moskoeftrom*, which lies no farther north than a little beyond the sixty-eighth degree; and the navigators, who frequent the more northern seas, have hitherto met with no other vortices. And as for the island *Ruft*, near which this sea-vortex is placed, the similitude of the name shews it to be the island *Roest*, which is but four Norway miles from the *Moskoeftrom*. This island of *Ruft*, may possibly be the same neck, or cape, in the north, to which Pliny gives the name of *Rubeas*.

Ulysses afterwards reports, that ten days after sailing by *Charybdis*, he came to the island *Ogygia*, which he describes, as divided by four rivers, each having its particular outlet. This remarkably corresponds with the island *Hinde*, which is so intersected by deep creeks, in the south, north, and east parts, as to be divided into four parts, of which the southern belongs to *Salten*, both the western parts to *Lofoden* and *Westeraalen*, and the north part to *Sennien*. One of these creeks is called *Oegursfiord*, or *Agisfiord*, an appellation which has some affinity with that of *Ogygia*; and that *Ulysses*, whose name was *Outin*, lived seven years in this island, married and had children there, agrees with the account of our chronicles concerning *Outin*, where his genealogy is called *Haleigatal*, because his descendants lived in *Halogaland*, from which *Outin's Hagen Ladejarl* derives his origin, and according to *Sturlesen*, this genealogy has thence obtained the name of *Haleigatal*.

Plutarch,

Plutarch, likewise, in his treatise *De Facie in orbe Lunæ*, makes mention of some Grecian people, who lived in the islands of the north, where the sun was visible for thirty days together; and did not, during that time, descend above an hour beneath the horizon. This can be applicable to no other islands, than those in Helleland and Salten; for to this present time, neither in the east or west, has any island been discovered, with any such phenomena; but on the island of Dum, in Helleland, the sun, in summer, about the longest day, is clearly seen both day and night, which shews this island to lie in the $66\frac{1}{2}$ degree under the arctic polar circle, where the frigid zone begins; but the farther one advances towards the north, the higher the sun is seen at midnight, above the horizon. It is very possible that Pliny might have intelligence of this island of Dum, if that, which he calls Dumna, be the very same island. And when Plutarch further writes, that the Greeks on that island, were persons of abstemious lives, and accounted a most venerable race, this tallies with Sturlesen's relation of Outin, and his retinue, namely, that they were held to be gods, and that divine honours were paid to them." So far I have cited from Mr. Ramus.

Another remarkable particular in the waters of the north, and withal, to me more unaccountable, than what has hitherto been mentioned of the Moskoestrom, is the Külstrom, as it is called, four Norway miles off Bergen, in the parish of Lindaas, running betwixt the continent and many small islands, and to which we may properly apply the motto, *Semper contrarius esto*, from the continual opposition of its course to that of others, flowing when they ebb, and ebbing at their floods. Whether this irregularity be owing to the length of its course, in several small channels between the islands, the water being so long detained as not to ebb, till it returns from the sea in other places, or what other cause further experience may suggest, I pass over; concluding, with this admonition, that on this Külstrom, the inadvertency of a pilot is extremely dangerous, of which there was once a melancholy instance in the loss of seven northland barks.

The Kül-
strom.

S E C T. XI.

Fresh-waters,
particularly
springs, in
Norway.

From the north-sea, and the salt-waters, I now proceed to the fresh springs, rivers, and lakes. Here, as in other places, these are not equally light, pure, and wholsom, their qualities depending on their bottom, or the strata of earth or stone which they meet with in their course, generally bringing with them particles of what they have carried off by the way. As to this circumstance, our Norway springs are not much to be boasted of; for their beds, or bottoms, shew them to have so much chalk, clay, or oaker in them, that a drop on a plate, leaves a white, brown, or yellow spot. However, the fresh-water in Norway, in general, may be considered as good and salubrious, I may say, very good, in comparison with others, as the water, together with the air, unquestionably, contributes greatly to the vigour of the inhabitants, who enjoy an uninterrupted health, to a length of days, more general and far beyond the period allotted to the inhabitants of most other parts of Europe. The common people especially, hold out to a very advanced age; for they live more upon water, than wine and other strong liquors. The metal, of which there is most abundance, both here and in Sweden, and which consequently most of all tinges the fresh-waters, is iron, for the aqueous particles being analysed, there remains a ferruginous matter subsided, which the magnet attracts, and which has upon most people a laxative effect.

There is likewise, no doubt, that our country affords several kinds of medicinal springs, tho', for want of due search, few such are become known; as the learned M. Lochstor complains in the following words, which I the rather insert, as they at the same time mention one of the afore-mentioned medicinal springs.

In Dissertati-
one de Medi-
camentis Nor-
vegiæ suffici-
entibus. Hafn.
1744.

“Coronidis loco monendum duxi, haud deesse Norvegiæ fontes medicatos, deesse autem, qui in horum vires et principia inquirant, solertes naturalium rerum studiosos. Memini enim, me vidisse fontem (quem paucis abhinc annis invenit sedulus naturæ scrutator avunculus meus Carolus Robsham in diæceseos Christianniensis districtu, cui nomen Hackedalen, circa villam quam habitat vulgo Buraas dictam) minerali quadam aqua scaturientem, a cujus usu convaluere variis morbis laborantes, ita ut etiam fama

ad exteros venerit, qui magnam hujus aquæ copiam sibi apportari curarunt." About two years ago, when I made a visit to Counsellor Swerdrup, proprietor of the iron manufacture at Hakkedal, he carried me to a spring, which is probably that mentioned by M. Lochstar; upon tasting it, I found the water light and palatable, and, as the proprietor informed me, it is very salubrious; especially in hypocondriac cases, by attenuating and rectifying the inspissated blood.

Mr. Peter Nicholas Undalin, in his description of Norway, relates from an old book, called *Speculum Morale* (doubtless a manuscript now lost) that the water of Birkedal-fen in Sundmoer, in this diocese, has a petrifying quality, and that within three years it turns hazle into stone, but not elder, which grows near it. As such a power is inherent in some waters*, and I myself have several undeniable petrefactions of beech, hazle, willow, and other wood, I made no difficulty of giving credit to this account; and tho' it appeared a little suspicious, when I first received some of this pretended petrefaction from the fen of Sundmoer, yet I suspended my judgment, till last summer; when on my visitation, I had an opportunity of informing myself more particularly from the minister of the place, Mr. Jver Munthe, at Volden. I found that there was no such thing as petrifying water in Birkedal-fen, but that on one side of it, there is a piece of an Amianthus, or Asbestos rock, which being divisible into long pliant threads, like flax, and being more like wood than stone, has been given out for petrified wood; and brought the neighbouring morafs into great and undeserved honour and reputation. This is so far from being any thing new, that it is a very ancient tradition, and many intelligent persons have been deceived by it; among others, Girald Cambrensis, as appears from his *Topograph. Hibern.* cap. viii. where he says, "Est et in Norvegia fons similis naturæ, sed tanto tamen efficacix majoris, quanto ad frigidam zonam magis accedit. In hoc enim non tantum ligna, sed et lina lineæque telæ per annum impositæ durissimum in lapidem congelantur,

* The water doth actually pervade, either longitudinally or transversally, the minute interstices of the wood, fills it with lapideous particles, dilates it, and when by a caustic corrosive power, which it derives from lime, it has destroyed the wood, it then appears in the form of the vegetable into which it penetrated. *Hamb. Mag.* Vol. II. p. 162.

unde

unde et Waldemaro Danorum regi nostris diebus regnanti, quidam episcopus Norvegiæ Afloensis, quod anno præterito probandi causa ab eodem susceperat, naturæ jam retulit bipartitæ: parte enim media fonti imposita lapis erat, altera parte, qua extra jacuerat, in sua permanente natura."

S E C T. XII.

Brooks, Rivers, rivulets, fresh lakes, and islands floating in them.

From the many springs issuing out of the mountains in Norway, and from the vast masses of snow accumulated on the summits of them, whence, at times gently dissolving, they send down great quantities of water, I have already taken occasion to observe the providence of the wise and good Creator, in these innumerable supplies of water, which streaming down the mountains, water their parched sides, and in their further progress, refresh the vallies and the level country beneath. By the junction and confluence of several of these rivulets, are formed those large streams and rivers, which in the old northern language, were called by the general name of Elven, from whence one of the largest rivers in Germany, by way of eminence, derives its name of Elbe (Elven.) I shall here speak of some of the most noted of these Elven, according to the best informations I could procure.

The Nied, is a river issuing from Tydalen, on the Borders of Sweden, runs westward into the lake Selboe, afterwards, winds to the northward, passing by the city of Drontheim, to which it anciently gave the Latin, as well as a Norwegian, name of Nideros, or Nidrosia.

Sule-Elv, so called from the mountain Sule (Sulefield) from whence, descending in a rapid course, it runs through Nordale into the sea.

Gaulen, or Gulen, has its rise eastward, near Skarsfield, a mountain in the north, on this side Roraas, and after running about twenty leagues westward, through Aalen, Hlotaalen, Storen, and Melhuus, discharges itself into the sea, about a league to the west of Drontheim. In the year 1344, great damages were done by a surprising inundation of this river, which, to the astonishment of the country, seemed totally drained, but in the mean time had buried itself under-ground, from whence it again burst forth with such violence, that the earth and stones thrown up by the

the eruption, filled the valley, and made a kind of dam, which, however, was broke through, and washed away by the force of the water: On this occasion, besides some churches, forty-eight farm-houses were destroyed, and two hundred and fifty persons drowned.

Otteroen is the largest river on the side of Agde, running thirty leagues from the mountain, through Sætterdale and Efie, to the cataract of Wiland, into which it empties itself.

Syre, or the river Sire, rises near the mountain Lang, runs thro' the vale of Syre into the lake of Lunde, in the diocese of Christianland, afterwards it discharges itself into the sea, not through a broad mouth, or by a gentle fall, as usual to other rivers, but shoots into it like an arrow, through a very contracted strait betwixt rocks, with such an impetuosity as creates, even in the calmest weather, a great agitation in the water, for the length of two leagues, and from my own experience, I can say, that the seamen must be very careful of coming too near it*.

Nid, which gives name to the lordship of Nedenes, and Skeen, from whence a town is so called, both issue out of Tellemark; and are equally large. Great quantities of timber for saw-mills being floated on them, the falls have, with infinite labour, been diverted, by canals and passages cut through the rocks.

The river Tyrefjord, or Dramme, discharges itself into the sea near Bragness, whither it also brings timber; near Honefoss, it is joined by two large rivers, of which one comes from Oedale, and the other from Hadeland.

Loven, or Laven, rises in the highest part of Nummedal, and after watering Kongsberg, loses itself in the sea near Laurwig, which derives its name from it.

Glaamen, or Glommen, is the largest river in all Norway, and as such distinguished by the name of Stor-Elven, the great river; from the foot of the mountain of Dofre it runs a long way thro' Oesterdale and Soloe, afterwards joins the Vorme, another large river, which comes out of Mioes and Guldbrandsdale; then traversing the lake Oeyeren, it hastens to Sarp, near Friederichstadt, whose chief dependance is the timber trade.

* It is unquestionably from some such confinement of a narrow outlet, that the Rhone protrudes its waters into the lake of Geneva, with such rapidity, that to a considerable distance, they retain their natural freshness, without any mixture of those of the lake.

Floating
islands.

Lib. ii. Ep.
20.

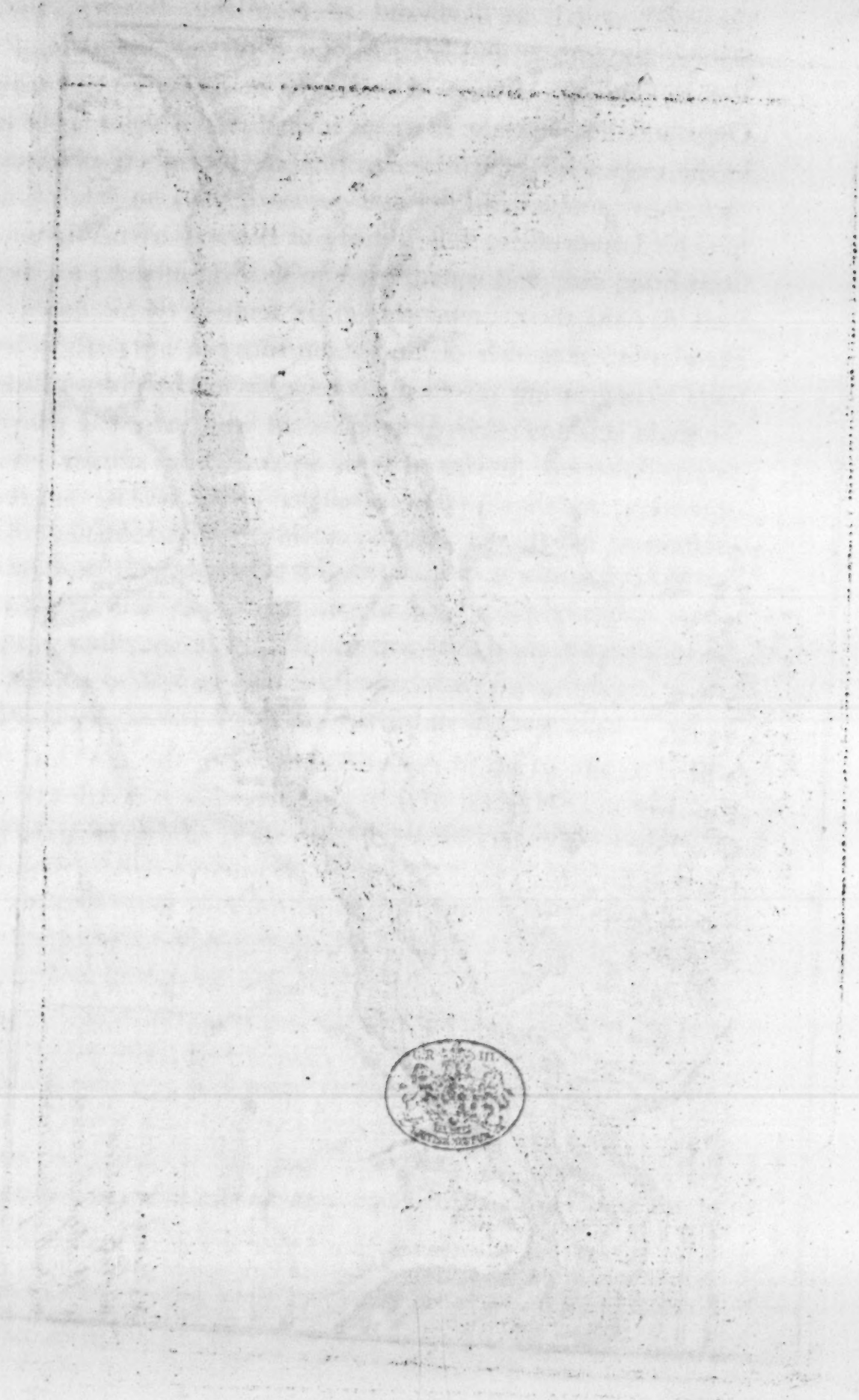
Among the fresh-water lakes*, through which these rivers run, the most noted are Ryffvand in Nordland, Snaafen, the lake Selboe, the greater and lesser Mioes, Slirevand, Sperdille, Rand, Vesten, Saren, Modum, Lund, Norfoe, Hvidfoe; Farisvand, Oeyevand, and several others, the situations of which may be found in the maps. My present design requires me only to observe, that these lakes abound in fish, and are navigable, in case of necessity, for large vessels. The history of Norway even informs us of fleets fitted out, and wars carried on in these inland seas, betwixt the kings and their competitors†. In some of them are also floating islands, or parcels of land about thirty or forty ells in length, with trees growing on them, which having been separated from the main land, are driven about as the wind sets, and when close to the shore, are shoved off with a pole. They are said to grow, as it were, by the accession of reeds, grafs, weeds, and the like substances. Both the Plinys, especially the younger, mention the like curiosities in Italy, which Kircher has also thought worth notice, in his *Mundus Subterraneus*, lib. v. cap. 2. particularly the floating islands on the lake di Bagni, or Solfatará, four miles from Tivoli; and, in my opinion, they are not different from those which I have several times seen in this country, particularly in 1749, on my return from Christiania, when the rains had swelled the river near Nitsfund to such a degree, that it overflowed a considerable tract on both sides of the valley, rising above the tops of the middling trees, and carrying away great quantities of earth and wood, some of which floated along side of my boat. Yet this is not a matter of so much wonder as what is called the Mardyne, which is frequently met with on the salt-water, in the creeks; these are level clods composed of sea-grafs, twigs, and the foam of the sea, upon which, the fishermen say, certain sea-fowls lay their eggs. If this be matter of fact, it must be acknowledged another instance of the providence and wise disposition of the Creator.

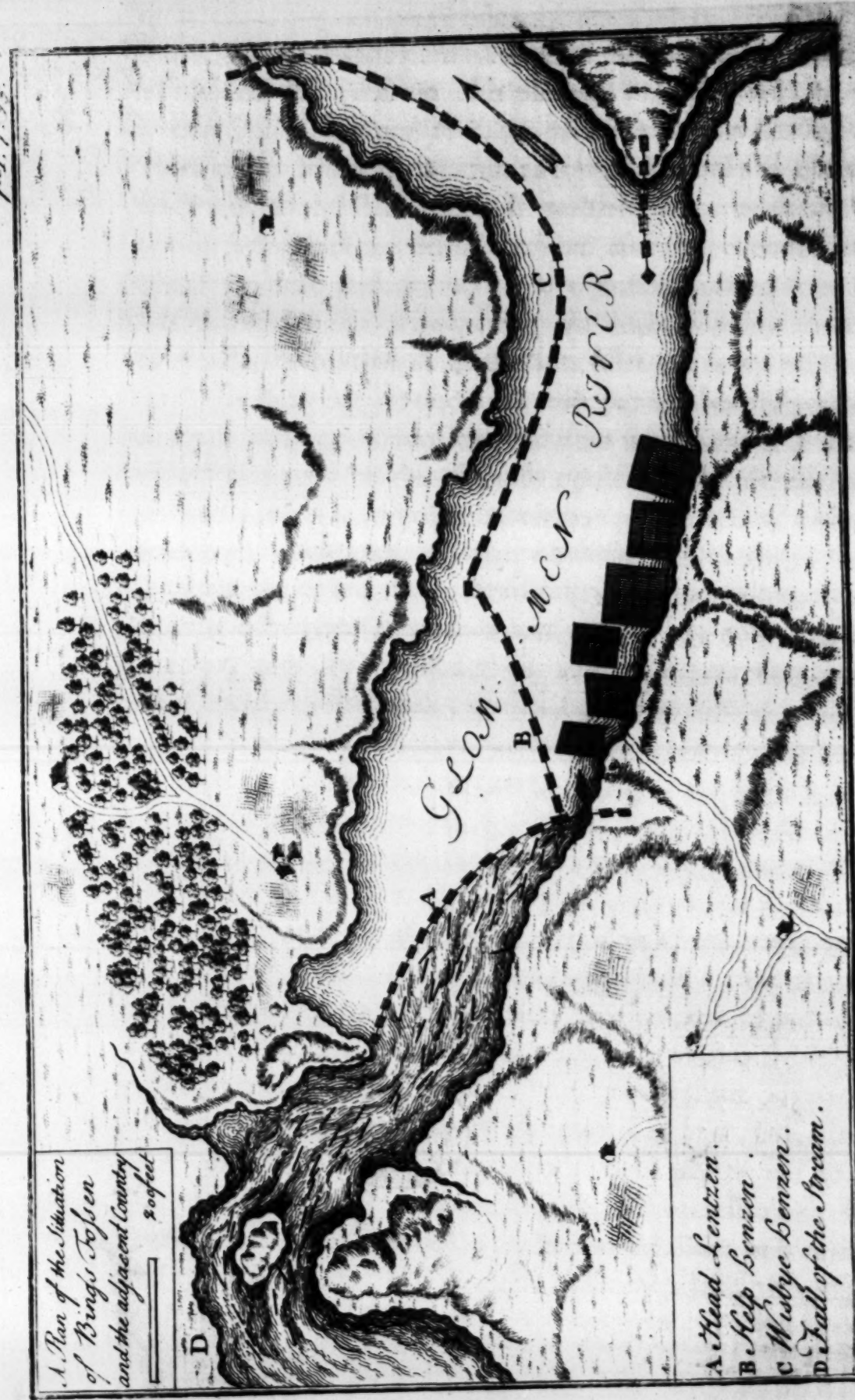
* M. Scheuchzer, in his treatise on the Mensuration of the Height of Mountains, judiciously shews the wise disposition of Providence, in providing for rivers, especially in mountainous countries, room to subside and break the violence of their fall or course, in the lakes where they spread their waters. Without this provision, they might by their inundations in summer, when the snows melt on the mountains, occasion great damage to the grafs and corn in the vallies beneath. *Philosoph. Transact.* Vol. xxxv. N° 1.

† Several vessels of considerable burden are still used in Faris-Vand, and some others, for the carriage of goods, especially for the use of the founderies.

23

THE UNIVERSITY OF CHICAGO





S E C T. XIII.

At any great distance from the sea, the rivers of Norway are not navigable for vessels of considerable burden; for though in many places, there be a sufficient depth of water, yet the waterfalls, caused by the intervening rocks and cliffs, are unsurmountable obstacles, the stream precipitating itself from a height of 6, 8, or 10 fathoms, where only masts and such timber can be floated down, and many of these are destroyed; yet the greatest part get safely through, and being marked by their owners, are secured at the Lentzes. These are large booms, fortified with iron bolts, and laid across several parts of the river for stopping the timber. The breaking of a Lentz is of such ill consequence to the timber-merchants, that in 1675 such an accident which happen'd by an inundation of the Glommen, occasioned many bankruptcies among them *. As these and other rivers perform the capital service of conveying from the mountains and forests those masts and timbers, which without such conveyance would be absolutely useless with respect to commerce, so by their several waterfalls they are of a further utility, in driving several hundred saw-mills, where, with little labour, planks and boards are sawed to all dimensions.

Great advantages of these waters for embarking and forwarding the timber.

See plate viii.

S E C T. XIV.

The vast force of rivers in some mountainous countries, where the fall from lofty rocks redoubles the motion of the water, may in some measure be conceived from what I have already related of the sudden subterraneous course of the river Gule, and the inundation occasioned by the subsequent eruption. But I shall here add another instance of this kind still more wonderful, which, according to the authentic account from whence it is taken, happened in the year 1702. I mean the sudden immersion of the family seat of Borge near Friderickstad into a deep abyss. The particulars of this unhappy and singular accident may be read in the 'nova literaria maris baltici ad ann. 1703. maj. p. 3. where is annexed a draught of the situation of the place. In the night of the

Water-falls from the rocks into the rivers.

* The yearly charge of such a Lentze or Boom, may in some places amount to three or four hundred Rix Dollars, but in return it yields to the owner no less than a thousand or eleven hundred, for at least thirty thousand dozen of large pieces of timber pass through it, of which each makes six or eight planks.

fifth of February, of the said year, that superb edifice, which was situate over against Hafflund, together with every thing in it, sunk down into an abyfs of an hundred fathom deep, the gap being instantaneously filled up by a piece of water, betwixt three or four hundred ells long, and of half the breadth. The house was doubly walled, but of these, as well as several high towers, not the least trace was to be seen; with it perished fourteen souls, and two hundred head of cattle. The lord and lady Wærneskiold, two children, and the steward had the good fortune providentially to save themselves. The lady being then near her time, was attended by a midwife, who in a great consternation came to acquaint them, that the house and ground began to give way, upon which they immediately crossed the water to a seat of her lord's brother, where the very next day the lady was delivered. The cause of this so extraordinary catastrophe, was no other, than the aforementioned large river Glåamen or Glomen, which precipitating itself down the waterfall near Sarp, had probably for a long time, in its subterraneous concealment, undermined the foundation, * for its course there is extremely rapid, and the water-fall near Sarp, driving no less than seventeen mills, is so violent, that besides the roarings thereof, which are heard four or five leagues off, its water is thrown up into the air to such a height, that at some distance, in dry weather, it looks like rain; consequently a rainbow may always be seen here when the sun shines, its rays being frequently refracted among the drops of water, and thus is exhibited the clearest idea of the formation of that meteor. These water-falls in Norway which are of different height and rapidity, tho' none equal to this, are no less dangerous, on too near an approach to them than the above-mentioned Moskoelstrom. Captain Wærneskiold had fatal experience of this in the year 1735, when, by inadvertency, the current of the Sarp water-fall overpowered him, and overset the boat. In these places swimming will not save the life of any animal, the ducks only excepted, who, after continuing for some time out of sight, emerge alive without any hurt, according to the report of those who have diverted themselves with the experiment. In ancient times this cataract is said to have been made use of for

* An instance of the like happened in Switzerland, 1618, when the whole town of Plurs suddenly sunk in and was never seen afterwards.

the execution of traitors, rebels, chiefs of seditions, and the like pests of society; they were thrown down alive to be dashed by the boisterous waters against the points of the rocks, that they might perish in a tumult, by a violence analogous to that, to which they had instigated others; a punishment, which, however severe, must be owned to have been very adequate and emblematical. The Egyptian water-falls or cataracts, mentioned by Pliny, were probably not so remarkable as these, and some others, in Norway, the fall of them from the rocks not exceeding seven or eight feet. And as the noise of our cataracts, how great soever, has never yet deprived any one of the sense of hearing, Cicero's account of the Egyptian Catadupa, may be considered as visionary*; though the learned Dr. Richard Pocock, who in his description of the East, animadverts on this account, may not have recollected other and larger cataracts, which may be further up the country.

S E C T. XV.

The bridges over the rivers in Norway, to the best of my knowledge, are not any where walled, but framed merely of timber, of which are made the stone-cases; these are large and quadrangular, and serve as pillars or supporters, being filled with stones in order to settle them. The largest of this kind, hereabouts, is the bridge of Sunde in Guldbrandsdale, where the water of the Great Mioses, which at first is called Oten and Laagen, begins to increase. This bridge, of which it is said that it is never finished, some repairs being continually necessary, is a thousand paces long, and consists of forty-three Stone Cases. Here in the diocese of Bergen, where carriages can be very little used, it is not thought worth the while to build strong and lasting bridges. In many places, the manner of their construction is thus; where the narrowness and rapidity of the current will not admit of sinking any stone cases, thick masts are laid on each side of the shore, with the thickest end fastened to the rocks of the mountains; one mast being thus laid in the water, another is placed upon it, reaching a fathom beyond it, and then a third or fourth in the like progression to the

Many of the bridges over the rivers are of a surprising construction.

* Ubi Nilus ad illa, quæ catadupa nominantur, præcipitat ex altissimis montibus, ea gens, quæ illum locum accolit, propter magnitudinem soni, sensu audiendi caret. Somn. Scipion. 5.

middle of the stream, where it is joined with another connection of mafts from the opposite fide, and this without any other cement than their contact, fo that in the paffage over it, efpecially in the middle, the bridge appears to fwing, which, to thofe who are not ufed to it, appears fo dangerous, that they alight from their horfes till they imagine themfelves out of danger.

S E C T. XVI.

Easy way of
travelling in
the winter on
the fresh-
water.

The beft paffage in winter is by the rivers, efpecially up the country. As they are every where deeply frozen, the peaſants find a very great conveniency in them for conveying their goods to the towns in their sledges, carriage being ſcarce practicable over the heights of the mountains. The travellers are conveyed in theſe sledges with great eaſe and expedition, for though the Norway leagues are very long, yet they go ſecurely at the rate of one league in an hour. Theſe winter roads, likewise yield an agreeable profpect, in the contraſt of the green valleys of pine and fir trees, with the ſnow, though the glaring of the latter, efpecially in ſunſhine, ſoon offends the eye, and here a piece of crape over the face is of double ſervice, as it likewise preserves the ſkin from the piercing froſt.

C H A P. IV.

Of the Fertility of Norway in variety of Vegetables.

S E C T. I. *Great difference in the nature and quality of the ſoil.* S E C T. II. *The Fertility greater than foreigners imagine, and chiefly from two cauſes.* S E C T. III. *Method of Agriculture and poſſibility of its improvement.* S E C T. IV. *Different kinds of grain, as Rye.* S E C T. V. *Barley.* S E C T. VI. *Oats.* S E C T. VII. *Peas and Vetches.* S E C T. VIII. *Wheat and Buck-wheat.* S E C T. IX. *Hops, Flax and Hemp.* S E C T. X. *Graizing and Hay.* S E C T. XI. *Excellent roots and garden vegetables.*

S E C T. I.

Great dif-
ference in the
nature and
quality of the
ſoil.

HAVING hitherto diſcourſed in general of the air, ſoil, and water of Norway; and having under farther conſideration, the animate and inanimate ſubſtances exiſting in thoſe elements, it appears moſt regular to proceed to the natural fertility of the earth

earth, in corn, grass, roots, trees, and every other kind of vegetables. I shall give accounts of all these from my own knowledge, or the credible informations of others, not doubting withal, but my successors in this work, will finish it with much less trouble, and much greater perfection; tho' to give universal satisfaction, is beyond the most extensive knowledge, and the most correct judgment.

Having specified the diversities of the soil and air in Norway, which possibly are greater than in any other country, it will appear, that vegetable products, as dependant thereon, vary in like manner. Norway is almost every where so unfit for agriculture, tho' not for pasture, that upon a measurement of the plowed lands, I do not think, the proportion, in respect to the meadows and woods, the wastes and barren mountains, would be greater, than as one to eighty; and if the peasants of Norway were not considerably assisted by the great fisheries on the sea-coasts, and the timber and charcoal-trade for the mines, the graziers, and the liberty they have of killing game, the country could not be supposed to furnish subsistence for above half the inhabitants; for as these visibly increase, and spread themselves year after year, so several tracts of uncultivated land, have been broke up and tilled; and several woods likewise have been burnt, and the land turned to husbandry; yet, with all these expedients, there would still be a scarcity in those places, where the nature of the earth and the rocks are not capable of any cultivation. Another misfortune is, that in some parts of the most fruitful provinces, as Gulbrandsdal, Osterdal, Soloer, and elsewhere, the grain is subject to miscarry by sudden frosts, so that one day it may seem in a flourishing state, and afford the pleasing promise of a plentiful harvest, but by the nipping cold of one night, it appears withered the next day, and drooping, so as never to attain to its proper ripeness. It is to be observed, moreover, that in every century, as far as can be ascertained from tradition, the country is visited with some unfruitful years, which are remarkably so, and happen two, three, or four, successively; such were the years from 1740 to 1744; when the sun seemed to have lost all its heat and genial power, the vegetables grew, but short of their natural height, and budded, and bloomed, without bearing. In those years, the trees, likewise,

Pernicious
night frosts.

failed in their growth and usual verdure, having no shoots at all, at the tips of the twigs. Most of the grain, that was sown, also perished, yielding only empty ears, insomuch that the disappointed peasant was reduced to extreme distress, from the uncertainty of any advantages in the labours and charges of the ensuing year. Something like this, tho' in a less degree, was felt in other places, during the above-mentioned calamitous years *.

Abundant
corn harvests
in some
places.

All these disadvantages do but furnish more matter for adoring, with the greater admiration, the impartial benignity of the Almighty Creator, in his provision for the sustenance of the people of Norway, not only in the variety of other means of support, which shall be specified in their proper place; but by their harvests, and success in agriculture, which, however inconsiderable, in respect to those of other countries, are much larger than a foreigner would conceive, till informed by an actual sight of them. Who would imagine, that Norway, in most years, should have some thousands of tuns of its own grain and produce, to spare for the adjacent provinces of Sweden? And who would imagine the fact, which Arn. Bernsen reports in his book on the fruitfulness of Denmark and Norway, that some farms, even in the district of Nordland, beyond Drontheim, expend forty, nay, some an hundred tuns of barley in seed, and that of a good kind, tho' not equal to the rye of this part of the country, which is accounted preferable to that of Poland? This fertility of Norway, even in its most northern Provinces, as far as Finmark, to the 68th degree, cannot but excite the admiration of thinking persons, since a line being drawn from the midst of this fruitful province of Nordland, that is, from the district of Salten, eastward, over the mountain Kolen, into Swedish Lapland, namely, Pitha-Lapmark, or even more to the south, the country is one wild barren waste, tho', according to Mr. Hogstrom's most ingenious and authentic description of Swedish Lapland, lately published, colonies, or new inhabitants, have, at the public charge, and by order of the government, been sent to cultivate these barren parts.

* If we recollect the weather from the year 1740 to the present year 1747, it must be allowed very extraordinary. The winters were long and severe, the summers but moderate, with little rain in many places, an almost continual strong wind at north-east. It were to be wished that the naturalists would favour the public with their thoughts on so interesting a subject. Hamb. Mag. B. 1.

For the cause of such a great difference, in point of fertility, at an equal distance from the line, the reader must be referred to what I have said in the first Chapter, Sect. VI. concerning the difference of the cold and warmth, the sharp and mild air in the dioceses of Aggerhuus and Bergen, which, tho' manifestly in a parallel latitude, differ as much in respect of cold and heat, as if they were situate ten degrees from each other. This, as I have before observed, is to be attributed to the warm vapours of the sea, which, spreading themselves over the western side, moderate the winters there, and have the same effect in all the maritime districts, to a hundred Norway miles north of Bergen; so that in fruitfulness, Nordland surpasses even this diocese, though with the additional advantage of better vallies, and larger tracts for tillage*; whereas, Swedish Lapland, which lies in a direct line behind Nordland, is deprived of these warm vapours by the Koelen range of mountains, which intercepts them, as Filefield does in the diocese of Bergen.

Next to that of Nordland, the most fruitful provinces in the diocese of Drontheim, are Inderherre and Nummedal; in that of Bergen, Sognifjord and Vaas; in that of Christianfand, Jeddere, Ryefylk, Raabygdalag, and the lordship of Nedenes; in the diocese of Aggerhuus, Hedemark; all which are not in the least inferior to the best corn countries in Denmark; and besides these, are Hadeland, Toten, Romerige, Ringerige, and Gulbrandf-dale. All these territories usually yield grain enough, not only for the support of their inhabitants, but a large surplus, which they dispose of among their neighbours, and even among the Swedes. On the other hand, in many places, a third or fourth of the inhabitants are not in a capacity of laying up a necessary quantity; which deficiency, however, is otherwise compensated to them.

S E C T. II.

It is moreover, remarkable, that the corn-grounds throughout the diocese of Bergen, which, on account of the many mountains,

Norway more
fruitful than
foreigners im-
agine.

* Agreeable to this, is what Thomas Bartholin says of the cause of the mild winters in Ferroe, which lies in the middle of the north-sea: "Aqua insulas Ferroenses allabens, quanquam per se frigida sit, salledine tamen sua ex perpetuo motu plerumque producit hyemem temperatam." Acta Med. Hafn. ad ann. 1673. Vol. III. p. 37¹.

are few, as to the best of my knowledge they, in most places, never lie fallow, but are every year plowed and sowed, bear all kinds of grain, barley and oats especially, and not only six, eight, or ten fold, but in some places with a much greater increase*; and the corn is generally allowed to be longer, and the ears fuller, than what is imported from Denmark and Germany, being inferior only to the English corn, which the Norwegians prefer to any other. I shall soon come to treat of every sort of grain, under its particular head.

Cause of this
fertility.

As to the cause of this fertility, which may appear very strange to foreigners, tho' it be strictly true, I shall give them the following indisputable account of it: The Almighty Creator, so wise and bountiful in his œconomy towards mankind, and whose greatness appears most conspicuously in the slender means he seems to make use of, appears to confer a double blessing on those small parcels of good land called closes and fields, which in other parts are looked upon only as little inclosures, and separated spots; yet he does not effect this in any supernatural or immediate manner. We know, that moisture and heat, are the two great promoters of fertility, and the fields of Norway enjoy a sufficiency of both †. They are not liable to such frequent and long droughts as other countries, being supplied either by rains or springs, gently issuing from the mountains, or the meltings of the masses of snow on the tops of the mountains. Besides, the snow-water, as well as the snow itself, is of a rich nature, so as by some to be thought a kind of manure. And when the fields begin to be parched, which is chiefly in the vallies, by the reflection of the sun, they are more easily refreshed by watering than in other countries, as being few, and of no great extent. In some parts, particularly Guldbrandf-

* Mr. Lucas Debes, in his account of Ferroe, p. 196, says, that a tun of corn-seed often yields twenty or thirty tuns of corn, yet is this in the main but a small matter, amidst such a scarcity of corn-ground, and where few can sow above a tun or two.

† “Tanta est soli cœlique fecunditas interrumpes boreales, ut semina terræ commissa multiplici fœnore agricolas beent. In insulis Ferroensibus, ex unico hordei grano, quinquaginta culmi cum totidem spicis excrescunt, granis turgidi, paucitatem terræ N. B. uberi proventu resarciente natura. Non fabulas narro. Ipse culmos vidi et manibus hic palpavi.” And in another passage soon after: “Ratio fertilitatis borealis ex nivibus repetenda terram imprægnantibus, et ex solis radiis, qui inter rupes fortius agunt. Et quanquam rupibus superstrata terra profunda non sit, ea tamen recipiendis fovendisque radicibus frumenti sufficit, quoniam, ut Theophrastus docet, Lib. 1. de Caus. Plant. c. xxii. plures quidem frumentum radices capeffit, sed non alte descendunt.” Th. Bartholin, Act. Med. Hafn. Vol. 1. p. 66.

dale the peasants, which according to Tavernier, is also practised in Persia, have contrived aqueducts from the upper grounds to the lower. These aqueducts are formed of hollowed timbers, which are not very expensive, and are carried on from the nearest spring to the field; out of these the water is thrown in shovels over the field, after the manner used at sea for wetting the sails, that they may draw the better and hold more wind.

As to the other principal cause of this fertility, I have, in the first chapter on the climate, shewn, that by the compression of the rays of the sun, collected betwixt the mountains, as betwixt the lofty houses in Copenhagen, the sun is extremely hot, or rather so intense, that without the summer breezes daily blowing from the sea along the creeks, whereby this heat is tempered, it would of all things be the most pernicious to the ploughed land. Hence our harvest is as forward, as theirs in Denmark or Lower Saxony; though our seed-time be later; yet the nights being short, the ground remains in a continual warmth, thus the growth of the corn advances without any check or intermission, that within the space of nine weeks the farmer has housed his corn. For the better clearing and confirming this point, I shall set down the words of a consummate Swedish naturalist, the celebrated Linnæus, in his dissertation on the natural planting of Vegetables. “Towards the pole the summers are shorter, and the days longer. The summer in France being longer than in Lapland, the fruits ripen sooner in Lapland than in France. About Paris the cool nights are longer, during which the growth being checked, they require the longer time for their full maturity; whereas in Lapland, the summer having little or no night, the fruits are in an uninterrupted progress. In 1732, for instance, corn was sown on the 31st of May, and in the barn by the 28th of July, having attained its due ripeness in 58 days. In the same year rye was likewise sown on the 31st of May, and cut the 5th of August, ripening in 66 days; this happened in Lulea Lapland, whereas further south there was no such forwardness.”

Heat betwixt
the moun-
tains.

Transactions
of the Swedish
acad. of sci-
ences, Vol. 1.
p. 22.

S E C T. III.

Agriculture in Norway, is not so burdensom to the farmer as in other parts; for here he does not toil in the fields of an oppres-
five

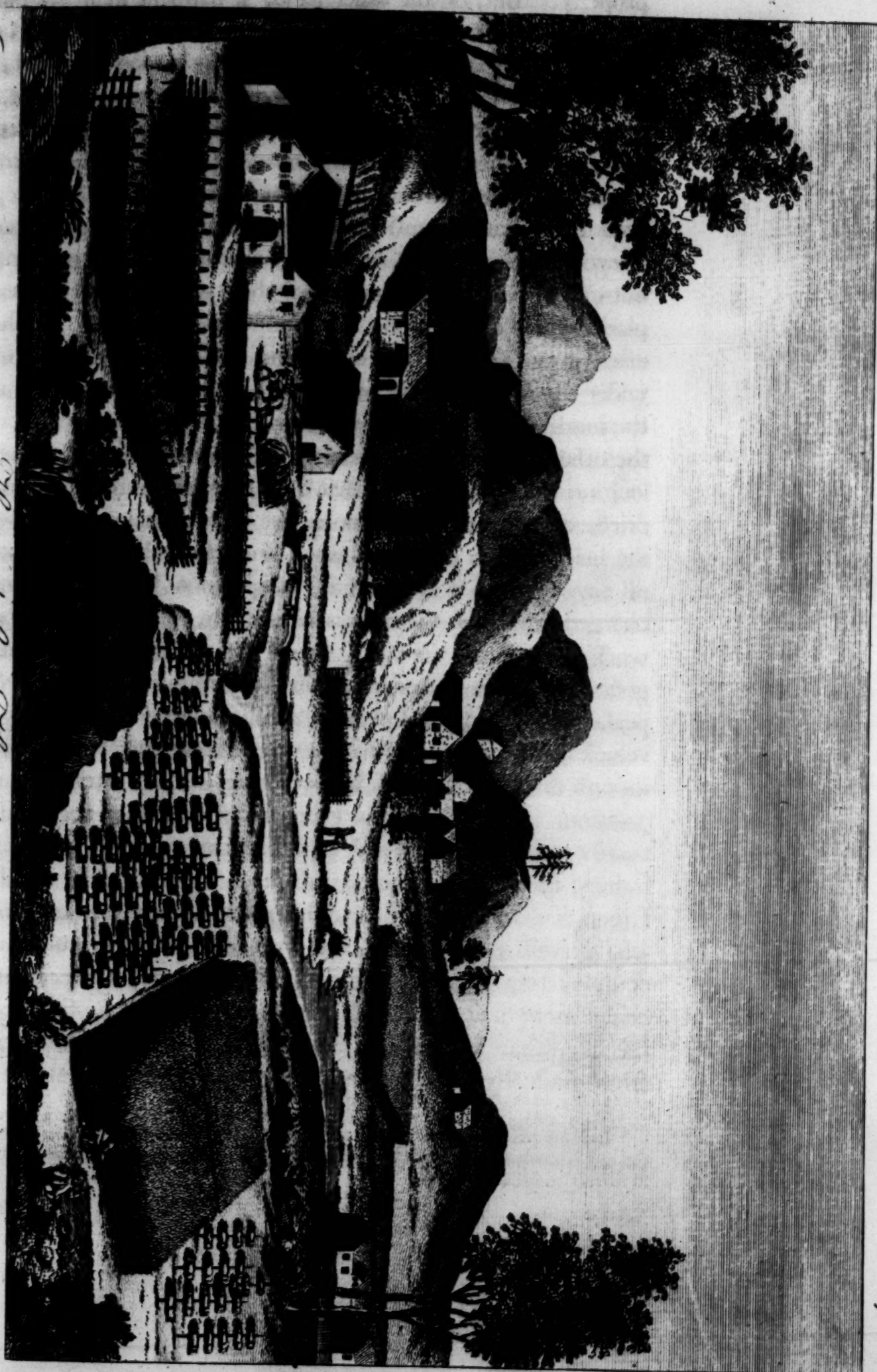
Plate VIII.

five lord, but the fruits of his labour are his absolute and certain property. But, on the other hand, it happens in many places to be attended with great labor and inconvenience, the fields consisting of little spots of ground among the rocks, many of which must be dug, instead of being plowed, and particularly here, in the diocese of Bergen, where the soil is less fruitful, and affords but few places, where the plow can be used, as it is in the eastern provinces*. The harvest also is not without its difficulties; the grain, according to the old custom of the peasants, not being mowed with a scythe, except about Christiania, where it is lately come into use, but cut with a sickle; and this is their practice even in those few places where the ground is level and clear of stones; for the corn often grows so thick and close, and the stalks are so apt to bend under the weight of the ears, that the reapers, both here and in the marsh-lands, grasp the stems with one hand, cutting them with the other, and immediately bind them in sheaves, which never lie long on the ground; for, that they may be thoroughly aired and dried, a great number of poles five or six ells long are set up in the field, and six or eight sheaves hung to each pole, so that several days rain, if it should fall, would soon be exhaled and discharged, and then the corn is housed. In this part of the harvest-work no waggons are used, except on the frontiers, where waggons have been introduced, but instead of them, the Norway peasants use sledges, for they are prejudiced against any other vehicles, even in places where waggons might easily travel, and though their work would be performed with greater ease and expedition. But in this and every thing else, they are so superstitiously tenacious of the usages transmitted to them by their forefathers, that they will not venture to remove a stone, which their fathers had suffered to lie. This rustic bigotry, which, more or less, prevails every where, is a great obstruction to public utility, counteracting all improvements in agriculture, the peasants here being more inclined to fell timber to serve in the fisheries, and the like, than to clear and improve their lands. However, this error gradually loses ground, since from the peaceable state of

* In some places where the ground is very stony, a crooked stick with an iron at the end is made to serve instead of a plow, as this yielding easier to the stones, is not so subject to break.

From 1.

1808.



Bay and Corn Harbours



affairs, an estate is come to be divided into several parts, three or four families now procure a comfortable support from a farm, which before was a subsistence only for one *. This has encouraged a diligent enquiry after spots of ground proper for sowing; stones begin to be removed, fens and morasses are drained by trenches, which are here called Veiter †, for carrying off the water, and are used in the newly cultivated grounds in many places, transversally, underneath them, an ell or two deep in the ground, where they are covered with earth, and lined with stones. The peasants are likewise improved in their knowledge of manures, and diligence in the use of them, such as fern and other large weeds, heath or moss, sea-grass, and other sea vegetables, likewise a kind of reddish earth, all which hath in many places had the good effect of enriching the worst and most unpromising lands. With respect to this signal increase and advancement of agriculture in this century, Mr. Peter Schrøder, superintendant and minister of Karmen, in the diocese of Christianland in a letter to me, among other things, mentions the following particulars; “the advantages this country has received from the indefatigable application of the inhabitants, within these forty or fifty years, in the improvement and augmentation of their arable lands, is beyond credit. Heretofore the farmer, who by his yearly tillage could support his family till Christmas, was accounted a notable man and in good circumstances, whereas now, in those years, when God does not punish the land with any remarkable scarcity, the inhabitants throughout this district, are, from their own grounds, not only plentifully provided with malt, barley and oats, throughout the whole year; but send some hundred tuns to market to Bergen, Hardanger, and Stavanger, &c.” In another letter this gentleman, who is well experienced in husbandry, communicates to me, at my request, some observations on the proper application of the several kinds of manure to the quality of soils,

* Even in this Diocese, where we have but little room for tillage, large farms are parcelled out to several farmers, and from the number of houses make the appearance of no mean village; Oppedal, for instance, an estate in the parish of Knitzerviig in Hardanger, which in the land-tax is assessed at 12 lobs of corn, that is 24 tuns; maintains 16 families, and these, according to the report of the minister, consist of 130 souls.

† An experienced countryman, told me, that, by introducing these veiters in his lands, he had doubled their produce.

which I likewise esteem worthy of public notice: "If the situation of a swampy field be such, that the cold moisture cannot be carried off by veiters, the natural resource is the warm and dry dung of horses and swine. Where the soil is dry and deep enough, sheeps-dung is the manure for barley; as cow or ox dung for oats; but if very hungry, sandy or hilly, for such there is no better manure than the earth of molehills in the swampy countries, which at harvest is collected for this purpose. By this distribution of every kind of dung or manure, varied according to the soil, all the plowed lands may in time be improved doubly, and be brought nearly to an equal goodness.

S E C T. IV.

All kinds of grain are sown in Norway, though not every where to equal advantage. In Hedemark, Jeddern, and in Nordland, rye thrives best, but the very best is the burnt rye, which is sown where woods have been burned for that end, and the ashes left as manure: They likewise sow vœrling or spring-rye, and great quantities of both are used in Sondenfield, since the arrival there in 1624 of some Rye-finlanders, as they were called; for these instructed the peasants in this method of converting their woods to arable uses, and manuring the land with the ashes. However profitable this may be, where the woods will bear such a consumption, yet it is detrimental and prohibited in other parts. The apparatus or method of proceeding is as follows. A peasant having found out a spot, which will answer to the sowing of half, or a whole tun of seed, he fells the wood, and leaves it on the ground two years, till it be thoroughly dried. When he proposes to set fire to it, which is generally about midsummer, he waits till he observes clouds, which promise him rain, his success in this case, depending thereon. Yet it frequently happens, that many are the dupes of a weatherwise neighbour's conjectures, for one has no sooner set fire to his wood, than another, relying on his judgment, does the like, and so on, that sometimes the flames and smoak of these fires are seen at once throughout a whole country. The wood being burned as much as possible, the greater pieces quenched, and the lesser, together with the surface of the soil, the moss, and small roots being reduced to ashes, without staying till the
earth

earth be cooled, the seeds are thrown on the ashes, still so hot that they give a smart crack, denoting that the husks are split. What remains is the expected rain to soak them; and if this actually happens, the peasant may sit down in the certain hope of such an exuberant rye-harvest, as will scarce appear credible to foreigners, tho' upon enquiry it will be found an undoubted matter of fact; for, without any extraordinary accident, a single bushel of burnt rye, will produce six, sometimes ten tun of the choicest rye*. This is certainly the effect of the concentration of the vegetative spirit in the ashes, which, before it can evaporate, impregnates the corn with such wonderful fecundity. And it is on this vegetative spirit that the chemists ground their regeneration of burnt plants, tho' in such an open place, a great part of them must certainly be dissipated by the intenseness of the heat. These conflagrations sometimes prove the occasion of dreadful mischiefs, as in the year 1739, at Oeyer in Guldbrandsdale, some houses were burned, and seven persons perished in them, proper notice not having been given to the neighbourhood. The knops of the pines shoot along the air like rockets, and have been known to set fire to houses at a considerable distance. When the fire first seizes the green wood, it is not only very violent, but attended with a boisterous wind and dreadful roarings.

S E C T. V.

Every part affords barley; but the best places for it are Nord-^{Barley.} land, the diocese of Aggerhuus, the lordship of Nedenes in the diocese of Christiansand, and Sognefiord in that of Bergen, where excellent malt is made of the common, and likewise of a particular kind, called David's-barley, or Heaven's-corn. This barley, which in threshing loses its husk, and very much resembles wheat, the peasants term Thor-barley, possibly from the opinion of the ancients, who, in their chimerical ideas of the Heaven, or Walhalla of the idol Thor, where the Cup of Health went briskly round, imagined this corn to be fit for the banquets of the gods, and heroes. Dr. Lochster, in his *Dissertation de Medicamentis Norvegiæ*, &c. extols the liquor made of it, both as palatable and

* A bushel, or in Danish a skiepp, is the eighth part of a tun, thus the produce of one bushel in seed is forty-eight, sixty-four, or even eighty.

Page 294.

Wonderful
changes.

wholsom. Palmam, says he, quoque reliquis præripit decoctum hordei cœlestis, vulgo Himmelbyg grato tam sapore quam effectu se commendans. Arn. Bernsen, in his book above quoted, on the Fruitfulness of Denmark and Norway, pretends that sometimes in wet years, the Norway barley degenerates into oats; whilst others imagine, that good oats, especially in Hedemark, improve into barley. But, without further proof, such anomalous metamorphoses appear to me scarce credible*, and my opinion is, that what first gave rise to this notion, was an accidental and unobserved mixture of a little barley with oats, or of oats with barley, which in some years, happened to thrive better than the intended grain, and this unexpected increase was mistaken for a transmutation.

S E C T. VI.

Oats.

Oats, are the grain of the most general use in Norway, both for the peasant's bread, which is made of it, and in some places for a kind of malt. It is also much larger, whiter, and mellow, than in other countries, and thrives in those lands, where, by reason of moisture or poverty, no other grain will answer. That oats are no less nutritive than rye, may be judged not only from the horses, but the singular strength and vigour of the Norway peasants. But amidst the great benefits derived to our peasants from good oats, in some places, especially in Ryefylke, they complain loudly of a kind of wild or spurious oats, which the French call folle avoine. Where once this takes root, it is extremely difficult to be extirpated, over-running large tracts of land, destroying the good grain, and proving as mischievous, as those complained of in Virgil,

Infelix lolium, et steriles dominantur avenæ.

* This however is espoused by Mr. Frederic Hoffman in these words, "Who has ever perspicuously demonstrated, by what means some plants come to be transformed into other kinds, for instance, wheat into tares, good oats into wild, a nutmeg in Europe into a walnut, &c." See his Rational Physical Theolog. Sect. xxvii. p. 96. Whilst I am writing this, a worthy friend of mine assures me, that to satisfy himself in this doubt, he sowed a can of the finest barley, without a single grain of oats among it; yet, at the harvest, of two cans of barley, one and a half proved oats. So I leave the matter without further discussion.

S E C T. VII.

White, grey, and green peas are sowed, tho' not to any great ^{Peas.} quantity, both in Suden and Nordenfield, the soil being loomy; but the best are produced in the district of Sognefiord in this diocese, where they were introduced by a clergyman, about the middle of the last century; and his experiment having recommended itself to imitation, I shall here insert a short account of it. Mr. Jacob Kirsebom, minister of Sognedal*, reading in Sim. Paul's *Flora Danica*, of an American small pea, under the name of *Pisum de gratia*, one of which being set in M. Klingenberg's garden, near Hamburg, had yielded 324, resolved to send for some, and on trial found the fertility of his Norway-garden far superior to that near Hamburg; it yielded him 610 peas for one †. Since which time the peas of those parts have been very much in vogue here.

Vetches, of which such quantities are sown in Denmark, as pro- ^{Vetches.} vender for horses, Mr. Jonas Ramus classes among the vegetables of Norway; whence I conclude that it must be far up the country where they grow, having, to the best of my remembrance, never seen any in these parts. In Valdres they are said to grow spontaneously, and sow themselves, but in no great plenty.

S E C T. VIII.

Wheat, and Buckwheat also grow here, but not in many ^{Wheat.} places, tho', it is not improbable, that upon trial, the growth of it might be considerably increased. Mr. Hans Casten Atche, minister of Leyerdal, in this diocese, being a native of Lolland,

* There is likewise a parish in the diocese of Christiansand, which bears the name of Sognedal, and which I am apt to think was M. Kirsebom's residence, and consequently where he first brought peas in vogue, as I do not meet with his name among the clergy of this diocese.

† *Pisum minus*, quod de gratia rocant, ex America ad Europæos translatus centuplum fructum ferre fama est. Attestatur D. Simon Paulli, vir magnæ famæ et experientiæ, *Class. III. Quadripartit Botan. in viridario nobiliss. Klingenbergii prope Hamburgum*, succrevisse pisum hoc de gratia trecentorum et viginti quatuor pisorum fertile. Quo exemplo invitatus Dom. Jacobus Joach. Kirsebom, pastor in Sognedal Norvegiæ, ex Hollandia ista pisa sibi afferri curans, recepit in Norvegia ex singulo piso terræ ibidem commisso, 610 pisa, quemadmodum ad venerandum suum parentem scripsit, d. 2 Junii 1672, cum D. Joach. Paulli laudabili proposito patriæque inserviendi voluntate Indos Danicos Orient. Navi petiturus prope Hitteroë Nory. vento contrario subsisteret. Thom. Barthol. *Acta Med. et Philos. Hafn. vol. I. p. 66.*

which is celebrated for its wheat, procured some from thence to sow in his grounds, where he tells me, it answered both in quality and quantity to the produce of Lolland. As to Buckwheat, the sowing of it here, appears too hazardous, both from the shortness of the summers and the night-frosts, particularly towards the east, which this wheat cannot stand, being of Oriental origin, in respect of the southern countries, and as such, is by the French called Blé Sarazin. However, some very good of this kind has been produced in Hedemark, and even in this diocese.

S E C T. IX.

Hops. Both the north and south parts have hop-gardens, but the best are those of Hedemark and Solloer. I have also seen very good at Sundmoer. Flax and hemp likewise grow here, but in a very small proportion to the demand for them. The west side, particularly, affords little or none; tho' here it would be well worth while to encourage the sowing hemp, on account of the great quantities used in making fishing-nets.

S E C T. X.

Grafs. From the corn-land, I proceed to the pasturages or meadows, with which Norway is so liberally blest, as not only to equal other countries, but to surpass many. A proof of this is, that in most of the provinces no flesh, butter, cheese, &c. is imported, except some bacon from Denmark, the good lands being too valuable to turn swine into them; whereas, every year from several parts, and chiefly Bergen, there is a very considerable foreign exportation of those commodities, especially suet and butter. The best and most nutritive pasturages are in Lofoden, Vesteral, Vas, Valders, Hallingdal, Tellemark, and the lordship of Nedenes. The Norway-cows are not indeed of the size of those in Denmark, and a consequence of this is, that they also yield less milk; but as to their fatness, those of the marsh-lands excepted, Denmark does not afford better; and accordingly the farmers here keep a greater number of cows. The best dainties among the Norway peasants consist in milk-meats, and variety of cheeses, on which they

they spread butter as on bread; besides which, they regale themselves with Draule, Myffebrüm, Gummegrød, and other white messes.

How well the Norway grass agrees with the sheep, appears from Mr. Berndsen's book of the fruitfulness of Denmark and Norway, where he says, that it is no uncommon thing for twenty-four or thirty-two pounds of suet to be found in one ram; and it is a striking instance of the succulency and increase God has been pleased to bestow on the Norway grass, that a very small valley, or dale, suffices for the support of several families, and their cattle; Davigen in Nordfiord, for instance, is not above half a Norway mile in circumference, yet as Mr. George Krog the minister there affirmed to me, it feeds very near two hundred people, and twelve hundred cattle of different kinds.

It is however to be observed, that in the spring the cattle do not graze in the vallies and on the skirts of the mountains after Whitfuntide; for when the feed time is over, and the people can be spared, they are driven on the sides of the mountains to Sacters, or to Stols, as the country phrase is, which at that season afford them sufficient fodder, the snow being no sooner melted than the grass appears, at least a quarter of an ell high, grown under the masses of snow, from which it derived both warmth and moisture. When the distance is within a Norway mile, the milk is brought home twice a day; but if the distance be two or three miles to those pastures, they keep Sæterboe or huts on the mountains, where a maid-servant, distinguished by the name of Buedye, constantly lives, for the security of the cattle against wolves, bears, lynxes, and other wild beasts, who generally fly from such a weak keeper. She is at the same time employed in making butter and cheese, with which she goes down to the house once or twice a week. Regulations against disputes and quarrels with neighbours or borderers, concerning this general right of common on the mountains, are laid down in the Norway Statute-book †.

† According to Dr. Shaw, both the milk and flesh of the eastern cattle, fed on the mountains are the best; besides, that thus the whole country is turned to use, another considerable benefit is, that the milk of cattle thus fed is much fatter and sweeter, as the flesh is likewise more palatable and nutritive. Travels to the Levant, Tom. II. chap. iii. p. 62.

The grafs in the vallies, or near the houfes, is cut for hay, and though in moft places it be mowed with a fcythe, yet in fome, like the grain, it is reaped with a fickle; after which it is hung to dry on hefgiers. Thefe hefgiers are a moveable garden, confifting only of poles faftened together, both in the length and breadth, by birch twigs, where the hay dries much better, and the rain evaporates fooner, than when left to lye on the ground *. The peafant dungs his meadows as well as fields, though the former but flightly. When the mofs is grown fo high, as to obftruct the growth of the grafs, whereby very great damages are done in many places, the experienced husbandman is not without a remedy, either plowing up the meadow to deftroy the mofs, or ftrewing it over thick with fand, if any can be had in the neighbourhood. But according to the before-mentioned Mr. Peter Schroder, who is a very experienced husbandman, nothing is more certain and effectual for this purpofe, than turf-afhes, where turf is burnt, or in a woody country to burn turf merely for the fake of the afhes, and lay them on thick over the meadows, which are thus damaged by the luxuriancy of the mofs. For the firft year indeed this method makes no great alteration, but in the following it is recommended by the moft happy effects, producing the fineft and melloweft grafs, intermixed with many falubrious flowers. The feveral kinds of greens growing here befides the common fort, are holly, quick, wild tanfy, rushes, fedge, goofe-oats, bienfen, (rushes) fheer-grafs, iglegas, ftoergras, (large grafs) or tourgras, of which fome particulars fhall be obferved in the fequel.

I am not acquainted with the kind of grafs or plant with fhort broad leaves, to which fome here give the name of *Viola Canina*, but by it, and fome leaves of forrel, the lives of two brothers were wonderfully fupported for feveral days. The fingularity of this ftory is fuch, that I cannot forbear inferting here a fhort abstract of it, for however it may appear a digreffion, yet it is not very unufual, in an account of the feveral plants of a country, and it is befides an interefting fact, as it furnifhes more than one inftance of the care of providence over perfons in the extremity of diftrefs. It may be read more at large in Oluf Bangs collections, p. 508.

* I have fince been informed, that thefe Hoesgier are ufed only in the diocefe of Bergen, they not being fo neceffary in other parts, where the rains are not fo frequent.

Olave and Andrew Engelbrechtsen, born in the farm-house of Toxen, in the parish of Guldødal in Gulbrandsdal, brothers and students, set out on the first of August, 1652, from the said house of Toxen, to take the diversion of shooting and fishing for a few days, in the high mountains, which separate Gulbrandsdal from the province of Valdres. On the second of August, after proceeding about four Norway miles, they came to a large water called the lake of Ref, where they stayed four days. On the sixth of August they were for returning home, but first rowed away to a very small island in that lake, being but sixteen paces long and half as broad, to draw up a net which they had spread there. Whilst they were on this island, by a sudden storm at east, their skiff broke loose, and was carried over to the other shore; by this accident, as neither of them could swim, they saw themselves in extreme danger of perishing with hunger. After having fasted the first day, they were for the space of twelve days, destitute of any kind of subsistence, except only the wild vegetable, which introduced this story, the *Viola Canina* and sorrel. Besides hunger, they had also severe winds and colds to struggle with, especially in the night, and being but thinly cloathed, as their travelling necessaries were on the banks of the lake, they must soon have perished with cold, had not the invention of one of them suggested to build a little hut of stones, where they might in some measure be sheltered from the weather. Their next care was to search, if this little spot did not afford some succulent vegetables, their appetite now beginning to grow keen towards the end of the second day; but their first searches were fruitless, at last they alighted upon a kind of broad leaved grass, without doubt *Viola Canina*, of which, twice a-day, each ate about an ounce, that being all they could find at one time, and as in this extremity they frequently implored the assistance of heaven, so their slender repasts were constantly attended with a prayer. They tried also the leaves of some bushes but found them too bitter. After thus devoutly eating their pittances of that grass, their spirits and stomachs were refreshed, and the acute pains they felt in their arms and shoulders abated. But the most remarkable circumstance in this sustenance was the happy proportion in which it was dealt out to them, and the sudden reproduction of it; for, according to their own account, which they

A remark-
able story.

PART I.

G g

them-

themselves published, from a principle of gratitude to God, and consequently cannot be supposed to have adulterated it with a deliberate falshood, they daily found no more than the above-mentioned very small portion; on the following day, their search was duly answered, though they had but the day before torn up all the other grafs, and the moss itself, to form a kind of a bolster, in their store-hut, and towards the period of their misery, they met with more than at first, but on the twelfth day, when their deliverance was at hand, this esculent entirely failed them, so that not a blade of it was to be seen. But on that day they met with something, which had hitherto escaped their eyes, tho' their search was confined to so narrow limits. This was a little spot, all overgrown with sorrel, which they cleared, and fed on it with a devout cheerfulness; yet, when in the evening Andrew Engelbrechtsen crept thither, being unable to walk, he found it fresh grown. It may be surmised, that this was another spot which had not been touched, but to obviate this, he says, that they had taken exact notice of the place, having observed a piece of wood lying near it. In the mean time, these distressed young men, did not give up all hopes of being delivered by some persons who might resort, as many did, to these desert mountains for the diversions, which had drawn them thither. The instrument which providence made use of for their preservation was their dog, who after continuing eight days with their little baggage on the shore, had returned home howling and moaning: From the grief of this faithful creature it was concluded they had met with some misfortune, and a man was immediately dispatched to the mountain in search of them; coming thither on the eleventh day, he could get no sight of them, but found their clothes, &c. and from several marks, he conjectured they had not been there for a considerable time, upon which he immediately returned with the melancholy news, that they were probably drowned. On the twelfth day, being the 17th of August, Olave Engelbrechtsen, appearing to be at the last gasp, his heart throbbing with a violence so as to be heard, they sunk into despair, and Andrew, the younger, with what remains of strength he had, cut out on some pieces of timber which were most in sight, a concise relation of their unhappy fate; and the text, upon which he chose their funeral sermon should be preached,

Pſalm lxxiii. ver. 22. and 26. After this they mutually encouraged each other in the hope of eternal felicity, to patience, and perfeverance in faith, jointly recommending themſelves to God, and totally deſpairing of all temporal relief, ſince the above-mentioned herb had failed them. But in the night between the twelfth and thirteenth day of their famine, being the eighteenth day of Auguſt, their hearts were revived, by the ſound of horſes galloping up the mountains; upon which they called out, and being heard, the riders flew to their aſſiſtance, and putting off in their boat, which, as another inſtance of God's paternal care, had received no damage, brought them aſhore. Food being offered to them, the elder brother could eat very little of it, and the little he did eat, threw him into ſuch a diſorder, as after his return home confined him eight days to his bed; however, he ſurvived it thirty-ſeven years. The younger brother found himſelf leſs incommoded, and in the year 1691 drew up this relation, particularly thanking God, that their dog, the ſubordinate means of their deliverance, had not ſwam over to them when they called, and made all the ſigns imaginable, with a view of killing him for their ſuſtenance. I beg pardon for this digreſſion, and reſt the truth of the fact upon the authority of the party himſelf.

S E C T. XI.

After thus treating of grain and graſs, the chief ſuſtenance of men and other animals; the culinary and garden vegetables are the next in order for our conſideration. The common people here, and eſpecially in the country, have very little taſte for theſe, and even the towns and cities uſed to be ſupplied from England and Holland with cabbage, leeks, and other roots. But in this century, eſpecially within theſe forty years, a foreign ſupply is become leſs neceſſary, as gardening grows more into vogue, for which the country is partly indebted, to a very uſeful little piece, intituled, *The Norway Horticulture*, publiſhed at Drontheim, by Chriſtian Gartner; and a happy experience has ſhewn, that all kinds of eſculent vegetables thrive in our gardens; they produce cabbage of all kinds and colours, green, white, or red, likewiſe green peas, common and french beans, aſparagus, artichoaks, melons, cucumbers, garlic, parſley, ſellary, marjoram, thyme, ſage,

All kinds of
eſculent and
garden vege-
tables.

sage, penny-royal, purslain, sorrel, lettuce, spinnage, endive, cresses, charvil, dill, fennel, and cummin, the last growing wild, especially in Nordenfield; accordingly it has no place in gardens, increasing spontaneously to such quantities, that from Christiania, it is exported abroad. Our gardens likewise furnish us with all kinds of roots, as yellow, red, and common carrots, parsnips, radishes, potatoes, together with a particular kind of northern turnips called Naper, which the peasants endeavour to raise more than any other, and sell by tuns in the cities. These are sometimes very large, and as flat as a dish. A man of veracity has assured me, that not many years since, he had in his garden one of these Napers, weighing twenty-seven pounds. They keep best in the little hillocks to be met with among the swamps, where they continue entirely fresh, even so late as spring time.

In order to forward the growth of certain vegetables, where the summers are short, the example of burgo-master Jurgens of Drontheim, is recommended to imitation in the above-mentioned *Horti Cultura*, p. 23. This gentleman, at harvest time, set in his garden at his seat of Harli, several plants, which might be sown early in the spring, but which being covered by the snow during winter, were alive, and very forward in spring. But this method, however adviseable in the inland parts of the country, will not hold good in the maritime parts, for want of such lasting snows, the winters here being rather wet than cold.



C H A P. V.

Account of the Vegetables continued.

SECT. I. *Medicinal and other plants and flowers.* SECT. II. *Noxious herbs.*
 SECT. III. *Wholsom and palatable berries.* SECT. IV. *Of the Norway woods*
in general. SECT. V. *A catalogue of Norway trees.* SECT. VI. *Moss upon*
the trees and stones.

S E C T. I.

FROM the common esculent vegetables, I come to treat of ^{Medicinal and other plants.} several other kinds of plants and flowers, which Norway affords, some salubrious, others agreeable to the sight or smell; some planted in gardens, others growing wild; and I shall gather my informations either from books, especially that of the accurate Mr. Ramus, or from the epistolary correspondence I enjoy, with persons of parts and candor. Among the written helps, I must acknowledge the preference due to an *Herbarium Vivum*, written by Mr. Godfrey Henry Langen, who, for various purposes, but particularly to acquire a knowledge of the Norway plants, hath visited several provinces, making some stay in Nordland, an hundred Norway miles beyond Bergen *. From these authorities, I have set down the following, with remarks where I thought them proper and requisite, omitting remarks upon those plants that are common and generally known.

Abfinthium maritimum (likewise *pratense*.) Sea-wormwood.

Acetosa major, minor, fontana. Sorrel.

Acetosella. Petty-sorrel, sheep-sorrel.

Aconitum magnum. Wolfsbane.

Adiantum aureum. Golden maidenhair.

Agrimonia. Agrimony, liver-wort.

Alchimilla f. pes leonis, item minor mathioli, foliis divisis et subtus albicantibus. Ladies mantle; Pa-de-lion.

Allium montanum latifol. Sylvestre, tenuifolium. Broad-leaved mountain-garlick. This, in some places, is so intermixed with the grass, that it gives a disagreeable taste to the milk, as if

* This *Herbarium Vivum*, is the more valuable for the lively freshness of the colours of the several plants and flowers, beyond any thing of the kind I ever saw; but whether this be the effect of the air, or of the plants themselves, I cannot determine.

garlick had been boiled in it. This species of garlick, has some appearance of may-flowers, and is accounted a better medicine for the scurvy, than even scurvy-grafs.

Alfne vulgaris, longifol. nemorum hirsuta, folio *Euphrasie* rotundo et crenato, facie *spergulæ*. Chickweeds.

Althea. Marshmallows.

Alysson Germanorum. Madwort.

Anagallis aquatica. Brook-lime.

Angelica vera officinarum, feu *Archangelica*, grows here and there in the vallies, but delights chiefly in the mountains, where it is as plentiful as in Switzerland. The highland peasant, not only chews it in a morning dried, but likewise makes a snuff of it. The bears likewise are very fond of the stem till it grows tough and sapless.

Anserina, *Argentina*, likewise called *Potentilla*, from its anodyne and vulnerary property. Wild tansey.

Anonis non spinosa, flore purpurascens. Restharrow.

Anthyllis leguminosa. Kidney-vetch, or lady's-finger.

Antirrhinum angustifol. cærul. item flore luteo. Snap-dragon, or calves-snout.

Aparine et gallium album. Cleavers, and white ladies-bedshaw.

Apios Hieron. Bock. Earth-nuts.

Apium palustre, et *Sylvestre*. Smallage.

Aquileja flor. cærul. simpl. Columbines.

Arnica Zogea lupi: Motherwort. It is in great use among the Norway peasants, against pains in the back or limbs, a decoction of it in stale beer operating by perspiration.

Artemisia vulgar. it. tenuifol. Mugwort, or white-wort.

Asperula odorifera. Woodroof.

Asphodelus palustr. luteus. Kingspear.

Astragalus flore flavo, radice bulbosa. Silk-vetch, or wild tares.

Astrantia Sylvestris, aquatica, fol. angustis, parum hirsutis. Black masterwort.

Atriplex major, minor, maritima, fol. scutato, foetida. White and stinking Orache.

Auricula muris. Mouse-ear.

Barba

Barba caprina, S. *Tragopogon*, fl. luteo. Goats-beard.

Bardana. Burdock.

Bellis major, *Buphtalmos*. Ox-eye.

Betonica. Betony.

Bifolium, latifol. sine testiculis et palmis. Tway-blade.

Bistorta minima. Small-bistort, or snake-weed.

Bonus Henricus. English Mercury.

Branca ursina, *Branckursine*. Bears-breech.

Brassica Sylvestris, S. *Lampfana* fol. integr. et laciniatis. Nipple-wort.

Bryonia. Bryony, Hedge-plant.

Buglossa vulgar. it. *maritima*: Bugloss, or ox-tongue. This plant grows along the shore in Northland, so as to be often overflowed, and thereby contracts a saline taste. Its leaves and stem nearly resembles purslain, and it runs along the ground to a great distance. Mr. Lange does not mention his having seen it any where else. It is a good vulnerary, and corrects the motion of the blood.

Bursa Pastoris. Shepherds-purse. Experience shews it to be an excellent medicine for attenuating the blood, and abating a fever.

Calamus aromaticus.

Caltha palustris. Marsh-marygold. The Norway peasants, judge by the appearance of this flower, when to turn their cattle to graze.

Campanula major et minor cœrul. Hedge-bells.

Caprifolium. Honeyfuckle, woodbind. See *Periclymenum*.

Carduus aculeat. et non, caule angulari et spinoso, it. folio lævi lactescente, it. *maritimus*, it. *pratensis* flore purpureo et albicante. Thistles of different species, some of which bear corn, which in a time of dearth, may be grinded and baked instead of bread; and thus the curse, *thorns and thistles shall it bring forth to thee*, is amongst us converted into a blessing. When the thistle-tops are full, the peasant depends upon a good harvest.

Cariophyllata, flore nutante, it. flore luteo, radice odorata. The herb avens, likewise called the herb of St. Benedict.

Cariophyllus marinus. Sea-gilliflower.

Cauda muris. Mouse-tail.

Chamæmelum vulgare. Camomile.

Chamæbalanus. Pignuts.

Chelidonium majus flore luteo et min. f. rotundo. Celandine,
or swallow-wort.

Cherifolium. Chervil.

Chrysanthemum segetum. Corn-marygold.

Cicuta. Hemlock.

Cicutaria. Bastard-hemlock.

Cochlearia. Scurvy-grass. This grows every where in Norway in great plenty, and of several kinds, as, *repens et furgens*, *ramosa*, *punctata*, et *non punctata*, it. *folio crenato et inciso*, particularly the *Cochlearia maritima*, which grows along the shore, and from the ebb and flood undergoes an alteration, being alternately wet and dry. Its leaves are small, round, and thickish, and are justly esteemed the sovereign anti-scorbutic; and the further north it goes, the greater its value; in the spring the leaves are very small, but sowing itself again in the summer, its leaves towards winter are large and juicy.

Consolida major. Black-root, or comfrey. This, in some places, grows wild.

Consolida aurea. Another vulnerary herb, used for consolidating wounds.

Convolvulus major et minor. Great and small bin-weed.

Conyza major. Greater flea-bane.

Coriander. Coriander.

Coronopus maritimus. Sea-plantain.

Cotula foetida et non foet. Sweet and foetid wild-camomile.

Crista galli. Cockscomb.

Christophoriana, fol. *Ranunc.* Crowfoot-leaved, herb Christopher.

Crocus. Saffron.

Cuscuta. Dodder.

Cyanus. Bluebottle.

Cynoglossa flor. caerulea et purpurea. Hounds-tongue.

Cupressus sylvestris. Wild-cypress.

Dens leonis. Dandelion.

NATURAL HISTORY of *NORWAY*.

11

- Digitalis* flore albo et vario. Foxglove.
Doronicum. Leopard's-bane.
Dulcamara. *S. amara* dulcis *S. folanum* scandens. Bitter-sweet.
Echium, facie Buglossæ it. scorpioides majus et minus, flore cærul. Vipers-buglossæ, and greater and lesser mouse-ear. Scorpion-grass.
Equisetum ramosum et non. Horsetail.
Erysimum. Hedge-mustard.
Eruca sylvestris flore luteo. Wild-rocket.
Efula vulgaris et major. Great-spurge.
Eupatorium cannabinum. Hemp, agrimony.
Euphrasia. Eyebright.
Filix mas et fœmina, mollis, cornuta. Several kinds of Fern.
Filicula aperta, ramosa, florida. Osmund-royal, and other Ferns.
Filipendula. Dropwort.
Flos Africanus. African marygolds.
Flos Trinitatis. Harts-ease.
Fœnum Græcum sylvestre flor. luteo. Wild-fenugreek.
Fœniculum. Fennel.
Fritillaria variegata. Fritillary.
Fumaria latifolia. Fumitory.
Galeopsis major et minor. Hedge-nettle.
Gallitrichum Sylvestre. Wild Clary.
Gallium flore albo. White Ladies-bedshaw.
Gentiana. Gentian, grows in great quantities; is such a bitter, that when eat by the cattle, with whom it is a favourite root, it communicates its taste to the milk, but withal makes it particularly wholesom.
Gentianella. Bastard-gentian.
Geranium gruinum, caule rubic. it. sylvestre fuscum, it. flore cærul. Several kinds of Cranebill.
Glyzyrrhiza filiquosa. Liquorish. An infusion of it in brandy is used as a cordial among the peasants.
Gnaphalium flore vario. Lions-foot, or sea-cudweed.
Gramina diversa. Many kinds of grasses.
Hedera terrestris. Ground-ivy.
Helleborus niger. Black-hellebore, bears-foot, fetterwort.
- PART I. I i Hepatica

Hepatica nobilis. Noble liverwort.

Herba Paris quadrifol. Herb true-love.

Herba flammula jovis. Spearwort. A pestilential herb, pernicious to the cattle in those parts, where it grows plentifully, particularly occasioning tumors in their mouths.

Herba mercurialis. Mercury, or dogs-cole.

Herba trientalis fl. albo. White triental.

Herniaria. Rupture-wort.

Hieracium facie dent. leon. it. hirsutum, laciniatum, minus ramosum, spinosum, alpinum. Hawk-weed.

Hirundinaria. Swallow-wort.

Hispidita, si pes cati. Several kinds of cats-foot.

Hyacinthus racemosus juncifol. Hair-bells.

Hyoschiamus albus et niger. Hen-bane.

Hypericon vulgare, it. minus ramosum. St. John's-wort. It is administered here both inwardly and outwardly, in many cases, and with very good success.

Hyssopus. Hyssop.

Jacea nigra, fol. purpureo. Knap-weed, or mat-fellon.

Impatiens si noli me tangere. Touch me not.

Imperatoria. Master-wort.

Iris palustris fl. cœrul et luteo. Bulbosa, gladialis. Flag-flower.

Juncus varii generis. Several kinds of Rushes.

Lagopus. Hares-foot.

Lamium purp. et alb. Dead-nettles.

Lapathum, acetosum, it. aquaticum minus. Red and white Sorrel, and water-dock.

Lappa personata. Great-burdock.

Lavendula. Lavender.

Laureola, fol. deciduo, baccis atrovirentibus. Surge-laurel.

Lens palustris. Duckweed.

Lilium convallium, it. minus, f. bifol. Lilies of the vallies; these flowers are succeeded by a species of berries, ripening about harvest, in colour and figure like small cherries, of a grateful bitter, an infusion of them in brandy is by some accounted very wholsom.

Linaria fl. luteo. Toad-flax.

Lithof-

Lithospermum vulgare. Grummell or graymill.
Lolium. Darnel, and from its causing vertigos called in Norway-Svimling.

Lunaria vulgar, et racemosa. Moonwort.

Lupinus fl. albo, cœrul. luteo. Blue and yellow Lupines.

Lupulus sylvestris. Wild hops.

Lychnis latifol. glabris, fol. purpur. it fol. hirsutis, fl. albo, et purpureo, it. viscosa flor. purp. it parva saxatilis fl. candido it. minima fl. albo. Campions of several kinds.

Lycopodium, officinar. Wolfs claw-moss.

Lyfimachia lutea spicata, it. vario flore, spicata, galericulata. Yellow and hooded willow herb.

Malva hortens. fl. luteo. sylvestr. crispa. Yellow and other Mallows.

Marrubium nigrum. Black hoar-hound.

Matricaria. Fever-few.

Melilotus vera. Melilot.

Melissa turcica. Turkey-balm.

Mentha arvensis hirsuta. Field-mint; *crispa*, curled-mint; *aquatica*, water-mint.

Millefolium. Yarrow, milfoil.

Morfus diaboli, f. succisa foliis glabris, it. fol. parum hirsutis. Devils-bit used here for dying yarn green.

Morfus gallinæ. Chick-weed.

Myrica. Tamarisk; this herb though known to be extremely heady is made use of in brewing by some peasants, and supplies the place of hops in their liquor.

Narcissus. Daffodil.

Nasturtium, varii generis, agrarium, aquaticum, pratense, minus scutatum, pumilum. Cresses of several kinds.

Nigella. Fennel-flower.

Nummularia sylvestris repens. fl. albo. Money-wort. To this tribe probably may belong a Norway-herb, the name whereof I never could learn, but it deserves notice, a tea being made of it, which is a noble pectoral; its leaves are nearly orbicular, with a very small incision, at the fore part, being but half as big as a Danish shilling, and growing by pairs on a long, thin, round and hairy stalk, its flowers are little campanulæ, or bells of five leaves, white on the outside, but their inside beautifully variegated with

with red spots. The before-mentioned Mr. Lange, a person of universal experience and curiosity in botany, affirms, that he never met with it out of Norway, and recommends it for pectoral disorders.

Nymphaea alba, lutea, it. fl. unifol. White and yellow water-lily, its root is used in many cases.

Ocymastrum, flore albo et purpureo. Wormgrafs.

Omnifolium. Leaf-wort.

Ononis spinosa et non. Restharrow, prickly, and not prickly.

Ophioglossum. Adders-tongue.

Orchis latifolia, flore albo, binis et uno teste, it. tenui fol. fl. albo. Several kinds of satyrion.

Origanum. Wild marjoram.

Oxytriphylon. Sheep-sorrel.

Pæonia nobil. Male piony.

Papaver, erratic. et hortens. Wild and garden poppey.

Parietaria. Pellitory of the wall.

Pastinaca sylvestris, latifol. et tenuifol. Wild parsnip.

Pedicularis. Red rattle.

Pentaphyllum petræum, palustre, repens. Cinqfoil, or five-fingers, several kinds.

Periclymenum parvum. Little Woodbine, called in Norway devils-berries, the eating of them being pernicious, on which account, I have omitted them in the different species of berries, which I shall speak of in the sequel *.

Perfoliatum. Thorough-wax.

Perficaria maculosa et non, it. aquatica. Arsmart several kinds.

Phu vulgare. Common valerian.

Pilosella repens. Common mouse-ear.

Pimpinella faxifraga, fol. rotundo. it. prof. incifo. Pimpernel, faxifrage.

Pinguicula. Butter-wort.

Piper aquaticum. Water-pepper. So the ingenious Mr. Lange in his herbarium vivum, calls this vegetable, saying at the same time, that he never met with it any where but on the sea-coasts

* John Christopher Buxbome makes this vegetable originally a native of Norway, in a little memoir concerning it, which is to be found in the *Commentar. Academ. Petropol.* Tom. 3. p. 268. with this title, *De Periclimeno humili Norvegico.* Simon Paulli in his *Flora Danica*, p. 37. mentions it under the name of *Caprifolium*, Woodbine; annexing a good advice to those who are for making a medical use of it.

in Norway, and that he gave it this appellation on account of the taste of its leaves, which are of a middling length and breadth, rounding towards the end, with small carnation flowers with seeds in the calyx like the semen psylli.

Plantago major, caule spicato et capitato, minor latifol. it. longifol. it. hirsuta, it. aquatica. Several kinds of plantaine.

Polium montanum. Mountain-poley.

Polygala fl. cæruleo. Milk-wort.

Polygonatum latifol. it. angustifol. Narrow, and broad-leaved Solomon's-seal.

Polygonum. Knot-grass.

Polypodium. Polypody, wall-fern.

Potamogeton. Pondweed.

Primula veris fl. cæruleo. Blue Primroses. Possibly Norway is the only country which produces them of this colour.

Ptarinica hortenensis. Sneese-wort.

Pulmonaria. Lung-wort.

Pyrola spicata florida et minor uniflora. Two kinds of winter-green.

Radix rosea. Rose-root: However scarce in other parts, here it grows spontaneously, and besides its fragrancy and fightliness, is highly serviceable in the scurvy, though this property of it be little known.

Ranunculus, varii generis, vulgar. et dulc. fl. luteo, it. fl. globoso, it. palustris, it. vernus, seu anemone fl. albo ampliff. it. aquatic. fl. albo. Several kinds of Crowfoot.

Rapistrum agreste. Charlock.

Rapunculus vulgar. Rampions.

Regina prati f. ulmaria. Meadow-sweet.

Reseda marina lutea. Yellow Bafe-rocket.

Rhamnus solutivus. Buck-thorne.

Ros folis, rosa folis.

Ruta hortenensis. Garden-rue.

Sabina sylvestris. Savin; used by the peasants as a dye.

Salvia sylvestris et hortens. Sage.

Sanicula alpina. Sanicle.

Saponaria maj. et min. The greater and lesser Soap-wort.

Satyrium latifol. flor. purpur. et tenuifol. it. maculat. Three kinds of orchis.

- Saxifraga aurea.* Golden saxifrage.
Scabiosa hortens. et vulg. Scabious, an herb applied to sores and imposthumes.
Scorzonera. Vipers-grass.
Scrophularia. Fig-wort.
Sedum majus, it. vermiculare fl. lut. et albo. Great and little House-leake.
Sempervivum. Wall-pepper.
Senecio, f. erigeron. Ground-sell.
Serpillum. Mother of thyme.
Sideritis heraclea. Iron-wort.
Sigillum solomonis. Solomons-seal.
Sinapi agreste. Wild mustard.
Sisymbrium aquat. Water-creffes.
Sonchus asper laciniat. fl. lut. it. lævis lactescens, it. latifol. fl. cærul. Three kinds of Sow-thistle.
Sophia chirurgorum. Flix-weed, a vulnerary herb.
Spina crispa. The barberry-bush.
Spinachia. Spinnage.
Stæchas. Silver-knap-weed.
Tabacum. Tobacco. In the diocese of Aggerhuus endeavours have been used for the cultivation of it.
Tanacetum album. White Tanzy. *It. vulgare fl. luteo.* Common yellow Tanzy.
Taraxacum minus. Lesser dandelion.
Telephium f. crassula. Orpine.
Teucrium pratense, it. minus. Wild-germander.
Thalictrum. Meadow-rue.
Thlaspi scutatum, it. minus, acerrimum. Two kinds of treacle mustard.
Tormentilla. Tormentil.
Trichomanes ramosa. Branched-maidenhair.
Tricolor. spec. violæ. Pansies or hearts-ease.
Trydactylites. alpina, filicis genus. Fingered-fern.
Trifolium var. gen. acidum fl. albo, it. aquatic. fibrinum, it. corniculatum, it. hepatic. aur. fl. cærul. it. pratense fl. minuto albo, it. rotundifol. flor. purpur. Seven kinds of trefoils.
Tuba rubra Turcica. Turkish trumpet-flower.
Tubera var. gen. Truffles, several kinds.

Tulipa

Tulipa var. col. Various tulips.

Tunica. Pinks.

Tussilago, f. *ungula equina* fl. luteo. Coltsfoot: Dr Lockstor thinks its effects are like those of tobacco, and that it might be a good succedaneum to it; but besides the common Coltsfoot, here grows also another different from the other in the shape of the leaves, being tapering and very narrow towards the stem. Mr. Morten Ruus informed me, that the latter were particularly beneficial for recent wounds, the peasants, when especially in harvest-time they happen to cut themselves with a scythe, apply nothing but this herb to the wound, which it closes as it were instantaneously.

Valeriana græca maj. et minor. Greek Valerian, the greater and lesser.

Verbascum mas et femina, candid. et nigrum, Mullein, white and black.

Veronica maj. min, et minima, saxatilis. Speedwell; it is also called Norway-tea, and grows every where in great plenty.

Viola matronalis, alba et aurea, it. *sylvestris* fl. luteo. Dames violets, the garden and wild.

Umbilicus veneris caule sanguin. fol. linguar. Red stalk'd Navel-wort.

Unifolium. One-blade.

Urtica maj. et min. mortua fl. albo. Nettles, and dead nettles.

In the before-mentioned Herbarium vivum, there are above twenty more very sightly flowers and herbs, which the collector Mr. Lang, was at a loss under what kind of known exotics to place, and much less has he presumed to give them any name. I shall mention some others presently, which I have had several opportunities of knowing, previously observing, that the foregoing list, is a manifest evidence, how the infinitely wise Creator has abundantly furnished this land with such plants and herbs, as the diseases of the inhabitants most require. The distempers, especially towards the sea-coast, being scorbutic, there accordingly, as has been observed, grows not only angelica, rose-wort, and gentian, preferable to any in Europe, but likewise several other kinds of excellent cresses, trefoils, sorrels, and scurvy-grass. Among the latter, Mr. Christopher Steinkul, ranks Erich's grass, a thick leaved herb

The herbs of
this country
adapted to its
diseases.

herb, of which I had never heard before, which is to be found in great plenty on the islands of Northland, and of which the inhabitants of the continent are said to fetch away boat-loads, preserving it in tuns for winter provision, as a succedaneum to cabbage.

S E C T. II.

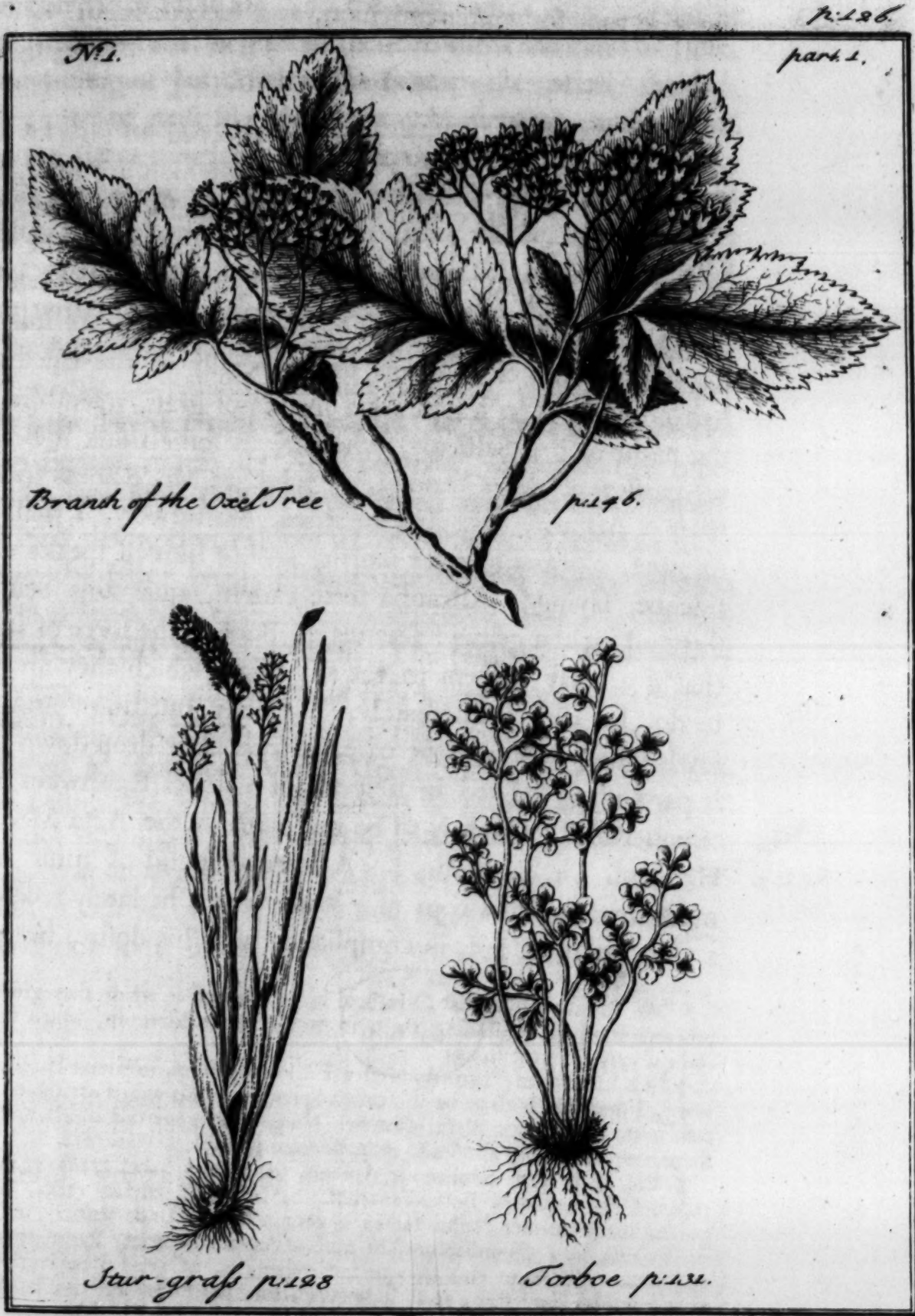
I now, pursuant to my promise, proceed to give an account of some vegetables growing in Norway, which are little, if at all known out of this country, but are chiefly noxious. In the parish of Vaage in Guldbrandsdale, particularly in the chapelry of Sel, and possibly in more places*, though unknown to me, grows a very singular and poisonous root, sometimes longish and knotty, sometimes rounder, and generally of the thickness of a half-crown. The leaves are a species of grass, resembling sedge, the name of it is Selsnape, whether, as some think it be the water-parsley of the Germans, or whether Mr. Ramus more justly styles it *Astrantia sylvestris aquatica*, Masterwort, I shall not determine, especially as the worthy author himself speaks with diffidence, saying; *Astrantia forte eadem, quæ aliis Selsnape, et forte ad cicutæ genus referenda*†. Such is the force of its poison, that if a beast happens to eat any of it, which they are very apt to do, he dies immediately, his belly bursting; and the very fowls who prey upon the carcase, soon after drop down dead, as is particularly related in a letter of colonel Reishwein to doctor Simon Paulli, which is to be met with in the *Acta Medica Phil. Hafniens. Th. Bartholin.*‡ A learned friend of mine has communicated to me a copy of a letter which he lately received from a clergyman, where, in compliance with his desire, he gives him

Vol. II. p.
129.

* Mr. Ramus thinks that Oere-land is the chief place where they grow; but this proceeds from his mistaking them from *Gramen officinatum*, which will be shewn to be a very different thing.

† In a letter of my learned ancestor Er. Pontoppidon, to Simon Paulli, idib. April. 1675, I find this herb to be also called *Sprengrod*; his words are these: "*Exsiccatum mitto tibi herbam illam, quæ Sels Nœpe et Sprengeroed appellatur.*" This last name unquestionably alludes to its poisonous quality.

‡ Vol. II. p. 128. *Similis est Apionis, sed radices habet crassas et nodosas instar radicum seu raparum Botfeldianarum. Si bestia, ut equus, vacca, bos, ovis vel porcus illam devoret (cujus tamen appetunt escam, unde rustici, ubi hæc herba crescit, ista loca circumsepunt, in quibus copiose luxuriat) statim moritur et dirumpitur. Venenum ejus quoque tam vehemens, ut avis, si cadaveri invollet, pariter concidat confestim, et si inde repellatur, statim ex ære decidat moriaturque. Hanc plantam hujus regionis incolæ appellant, Syllenabbet.*



THE
HISTORICAL RECORDS OF THE
CITY OF NEW YORK
FROM 1609 TO 1898
PUBLISHED BY THE CITY OF NEW YORK
1898



him a more accurate tho' not compleat account, of its good and bad effects in the following words: " This plant derives its name from the place of its growth, which is here in Guldbrandf-dale, in the parish of Waag, and the chapelry of Sels. It delights in swampy places, and begins to shoot towards the close of June, or the beginning of July, when the swamps are entirely divided. It bears a kind of grafs like the Norway Masterwort, and its root is about the circumference of a half-crown, some round, others oblong, as in the figure. None of the several medicinal dictionaries, which I have searched, mention either its use, or so much as its name, possibly from its being unknown to the authors; tho' a certain writer of Magdeburg speaks of the *Apium raninum*, which he interprets water-parsley, in the following manner; *Affectat ovicula ex paludibus apium raninum, cum tamen inter ovem et hanc herbam talis ἀντιπαθεία fit, ut ovicula statim moriatur, et in signum mortis ex Apio comestæ, in hepate ovis repariatur vestigium instar folii de Apio jecori animalis quasi impressum.* Which description evinces water-parsley and Selsnape to be the same; the latter being present death to the sheep; whereas in swine it is known to operate so beneficially, that it is the best medicine which can be given them. The poison of it is equally fatal to men, as the inhabitants of Sels know from many melancholy instances, and within my time, two children, having ignorantly eat of it, died soon after. Upon cutting a fresh root into slices, and throwing it into fresh water, it emits rays of different colours, and this water being put up with the Nape in a bunged cask, contracts a smell more loathsom than any carrion. As to the virtues thereof, it is found to be a specific in arthritic cases, for which it is used in the following manner; being sewed up in a piece of fine linen, it is fastened to the shirt so as to be placed on the part affected, either the arms, the loins, or other limbs; upon its being warmed by the natural heat of the body, the pain is immediately assuaged, and without any return, whilst the Nape remains applied to the body. This is known by taking it off, when the pain immediately returns, especially if the distemper be chronical, or if recent, the use of this remedy has been known totally to remove the distemper within a quarter of a year. Another singular virtue has also been found in it; an

inhabitant of the above-mentioned hamlet of Sel, had for several years been afflicted with an inward weakness, but whether it proceeded from the stomach or the breast was doubtful; the man however was in great misery, and at length confined to his bed; in his impatience he determined, without consulting any one, to eat a bit of Selsnape, and soon found himself relieved; upon the return of the fit he applied it with the same remedy, which effectually expelled it, and at length he was restored to a confirmed state of health, lived several years after, and this many credible witnesses can testify. However, I will not recommend this as a medicine, frequent experience having discovered the fatal operation of it, as a poison on the human constitution. This is the substance of what I know concerning the good and bad properties of the Selsnape."

Gramen Cffi-
fragum.

Plate ix. b.

Another vegetable, pernicious to the cattle, tho' not so fatal, growing in the manor of Sundbord, and in other parts of Norway, is a kind of stur-grass, or large grass, the leaves broad and pointed, with very little yellow flowers, its name among botanists is *Gramen Ossifragum Norvegium*. It has a very remarkable effect on oxen and cows, if they happen to eat of it; their strength totally decays as if their bones were fractured, or rather mollified, that without the strange remedy of administering to them the bones of other cows, which they devour with the utmost greediness, they quickly die. The before-mentioned letter of that eminent botanist Mr. Reichwein, to Dr. Simon Paulli, contains a description both of it, as well as of the Selsnape: Among other things he says, "*Confringit et conterit statim omnia ossa, ita ut fracta inter pellem circa bacillum, circumvolvi possint. Non statim tamen expirant, sed curari possunt, si illis exhibeamus ossa contusa alterius alicujus bestiae ex esu hujus herbæ mortuæ.*" This last circumstance, that the bones used for the cure must be of such cattle as have died by eating this grass, is contradicted in another letter of Mr. J. Fred. Marschalch, in the above-mentioned work, wherein is this passage: "*Non enim audivi exhiberi illis ossa animalium eodem gramine occumbentium sicut Reichwinus beatus scribit.*" A gentleman of this country, who from his own observation is acquainted with this stur-grass, and sent me the original from which the annexed figure was taken,

taken, informs me further of this remarkable particular, that a cow with calf received no damage by eating this grass, tho' such a violent corrosive in the bones of other cows; but whether, according to the above-mentioned expression of Mr. Reichwein, they become so mollified that they might be twined round a stick, which (upon the death of such a beast would be no difficult matter to try) he could not venture to assure me. And Dr. John Treubler, formerly city-physician, in his letter to Dr. Simon Pauli*, doubts of it; and as this greatly confirms and throws a light upon this point, I shall not hesitate to transcribe his words from the before-mentioned valuable collection: "Mitto unà cau- P. 133. seq.
lem graminis desiderati in frustra dissectum, ut angustia epistolæ caperetur, quod rustici nostri (quorum hac de re non paucos examinavi) Strotegrafs, dicunt, flores flavos jam amisit, plenos sæminibus, adhuc tamen immaturis, locis paludosis et humidis crescit inter alia dumeta; prope omnes villas colonorum primum gramen est, quod vere prodit, unde avida sunt pecora ad decerpendum, quam primum vero alia gramina copiosius prodierint, hoc gramen averfantur, forsan propter caulem duriusculum. Ex esu hujus pecora male habent, macie confecta, spina dorsi extra protuberante (unde rustici dicunt, quod dorsum sit fractum) pedibus ossibusque debilibus, ut ægerrime incedere queant. Quod autem prorsus mollia fiant ossa, vix fieri potest, alioquin omnia animalia perirent et humi prosternerentur: Pro antidoto rustici semper habent exsiccata ossa in promptu, quæ quotannis conservant ad hunc usum, quando carne prius abrafa usi sunt, eadem quoque ossa in plateis et ædibus colligunt, quæ exsiccata confringunt, et mox ab animalibus magno appetitu, in minima dentibus comminuta devorantur, unde quasi salivatio subsequitur, multum-

* However some naturalists, on the other hand, make no manner of doubt of the possibility of an emollescence of this nature, an instance of which is the following passage from *Biblioth. Raisonnée de l'An. 1746, Tome xxxvii. p. 262.* "M. Petit a eu bien des combats à soutenir au sujet de l'amollissement des os, que cet habile homme avoit un peu trop crû avoir decouvert le premier. Plus de vingt Auteurs avoient décrit avant lui cette cruelle maladie, qui détruit en peu de temps ce que la nutrition, et l'acrobissement ont fait en bien des années, et qui remet les os dans le degré de mollesse qu'ils avoient eu dans le fœtus. Monf. Bevan en a donné un nouvel exemple. Une femme fut attaquée d'une diabète, qui apparemment avoit extrêmement dérangé les sucres nourriciers; dixhuit mois après ses os s'amollirent, se prêtèrent à l'action de muscles, et se plierent à tous les mouvemens, que la supériorité alternative des muscles extenseurs et flechisseurs peut produire.

que

que aquæ ex ore profluit, ut statim melius habeant pecora et prorsus convalescant. Alii pro remedio in pharmacopoliis emunt radicem tormentillæ; plerique tamen et pene omnes ossibus acquiescunt. Videtur (quia rustici rationem nullam dare sciunt) quod pecora plerumque primo vere, terra adhuc humoribus nimis fœta, ex hoc gramine præcoci tantam in se humiditatem superfluum forbeant et devorent, que deinde per ossa exsiccare debet. Unicuique tamen suum relinque iudicium." That according to this learned gentleman's opinion, the bones of the cows are mollified by nothing but the extreme moisture of this grass, is what I must join with Simon Paulli in doubting; yet, I cannot positively assent to the opinion of the latter, that the soil where this plant grows must contain either quicksilver or lead ore, and that it is the mercurial spirit insinuated into this plant, which thus corrodes and dissolves the bones. But others may form a better judgment of the matter than I can.

Among this class of noxious roots in Norway, must be ranked Iglegras; the peasants in many places are very apprehensive of the mischiefs of this plant, especially in the government of Nordfiord, where they spare no pains to clear their meadows of it, as it operates on the sheep and goats by a violent spasmus or contraction, of which they die in extreme torture. Its root is large, shooting up a kind of bush of thick stems, or twigs; the leaves narrow, oblong, and indented, with blue flowers at the end of the stems, which about harvest produce a hollow bud of twice the bigness of a pea, containing the seed, and sometimes it is found full of worms and other insects. It grows chiefly in a cold, watery soil. I have compared it with several figures, and find that it has some affinity with the Anemone; likewise, according to Lonicer's description of it, with the Sideritis or ironwort, except that instead of white or yellowish flowers, it has blue. The eating of this plant in sheep and goats, and sometimes, tho' seldom, in cows, is followed by the Virdsygee, a kind of vertigo, the symptom of which is such a contraction of the nerves, towards one side, that the neck and head are violently distorted towards its hind-parts, under which distortion the beast continues turning round till it falls, and soon after dies. Sometimes, though not often, a sheep is saved by opening a vein in the neck, whereby the

the head is restored to its natural position. The relief for a ram or a cow is to perforate its horns, from whence a purulent matter issues.

Another kind of noxious plant is known under the name of Tourgrafs, which is probably derived from its effect, the word signifying the magic, or bewitching grafs; it consists of long thin stalks, extending themselves upon the ground, with little roundish leaves about the bigness of a Danish-shilling, in other respects like mouse-ear. This plant affects horses and cows with an unusual torpor, or a kind of lethargy, so that the most mettlesom horse immediately hangs his head, and becomes so dull and tractable, as to be managed at will. It is a known practice among jockeys, when riding together to a fair, to watch an opportunity of conveying some Tourgrafs into the mouth of another's horse, if he chances to be so much preferable as to prejudice the sale of the latter. The resource of the peasants against this distemper, and others incident to horses and cattle, is either castoreum, or a piece of an adder, put into dough, and thrust down the throat of the beast. If it be not the adder's head, but some other part, then the adder must be killed before midsummer, and be set apart for this use.

In some places, particularly in Hardanger, the mountains produce a plant not unlike rue, but with fewer leaves, called Torboe, likewise Heste-spring (the horse-plant) from its particular fatality to horses, and it is only in extreme hunger that they will touch it. Upon the first symptoms of having eat any of it, a strong purge of yeast, or any other cathartic, generally relieves them, or likewise violent exercise, to breath them; without this relief, they are immediately seized with a prodigious swelling in their belly, and a kind of lethargy. This herb, which is flatulent in the highest degree, is no wise detrimental to cows, sheep, or other ruminative cattle, as in chewing their fodder they draw in the air. There is in Vaas a plant called Turte, and from the little difference of the name, and the similar torpid effects, for which the poor creatures are often misused by the inconsiderate peasants, I was inclined to think it the same as the former; but being very well acquainted with the Torboe, having an exact draught of it, I find no manner of resemblance betwixt it and the Turte, which

Plate ix. fig.
c.

has much of the appearance of Angelica. The Bears are said to be extremely fond of it, and when by excesses in eating of it, they contract an oppilation, they seek for relief from the flesh of animals. Mariahaand and Fandenshaand, i. e. Devils-hand, are two roots somewhat resembling a hand with five fingers, but distinguished by their colour; the last is black and useless, and the first white, and good for sore heads, and other eruptions in children.

I shall close this subject of the plants in Norway, and their similarity with the plants, in other mountainous countries, with the following passage from the celebrated Linneus, "those mountains which reach the upper region of the air, and the surface whereof are continually covered with snow, produce their peculiar plants, of which the Alps in Switzerland, in Wales, the Pirenees, the Olympus, Baldus, and Arrarat, are instances, the like not growing in lower situations; as may be seen in Flor. Lappon. The plants are no where so exposed to strong concussions of the wind, as on the mountains, by which the growth and maturity of them is considerably accelerated. This is an expedient of nature to supply the shortness of the summer. Tournefort, in his hazardous ascent to the top of mount Arrarat, at the foot of it, met with the same vegetables, which he had found all over Armenia; a little higher he found several which had not occurred to him since his departure from France; in his further progress, he found *conysa cœrulea acris*, *cotoneaster folio rotundo*, *hieracium fruticosum angustifolium majus*, *jacobea senecionis folio rag.* *euphrasia vulgaris*, and others which are common in Sweden; but on the summit, he found the very same plants which are produced on the mountains of Switzerland, and Lapland." The plants which are described by Cæsalpin, Tournefort, Columna, and Pontedera, as growing on the lesser hills of Italy, abound in every meadow with us, all which proceeds from the air, and the altitude of the soil.

S E C T. III.

Wholsom
and palate-
able berries.

A great variety of wholsom and well-tasted berries are to be found in Norway; first, here are, as in Denmark, and other places, cherries of several kinds, of which, particularly the peasants in Sognefiord, and Hardanger, sell great quantities dried. Hagebar, probably a kind of sloes, an infusion of which in wine, like cherries,

cherries, makes pleasant and cooling liquor. Ribs, i. e. currants, red and white, which are here called vinbar, i. e. wine-berries; soelbar, sun-berries; hindbar, raspberries; likewise red and white stickklebar, Gooseberries; brambar, blackberries; biornebar, barberries; hyben, a kind of berries, which also are here called clunger; blaabar, bilburnes; and a large sort of them called blaakbar, or krakebær, cranberries, and especially the wholsom and delicious jordbær, strawberries; of which there is great plenty, besides many other kinds of such berries as are hardly to be met with in any other country than Sweden and Norway: The first of these is oexel or afaldbær, of which a farther account shall be given in the article of trees; tegebar or teyebær, by Lockstor called uvæ-norweg, growing on long stalks which run along the ground, and hanging at the end of them in bunches like grapes; the leaves are like those of the cherry-tree, the blossom white, small and conical, the berries in appearance like currants, but far surpassing them in taste *.

Tranebær, myrtillus repens, likewise grow on long small stems, spreading themselves along the ground; the berries are red and sour, and, like the sloe, do not ripen till winter, or rather the spring, when on removing the snow, I have gathered them on the mountain Filefield in their perfection, yet did not find in them that high flavor which the rein-deer seem to enjoy in eating them, and perhaps it is for their refreshment that the God of nature may have particularly intended them.

Crakebær grows upon a spinous stem of a middling height, not unlike the juniper-berries; the fruit has some affinity with the

* In Chinese Tartary grows a root called ginseng, which from the description and figure of it in father du Halde, Descript. de la Chine, T. II. p. 182. seems perfectly to correspond with the Norway teyobær, though it is not the berries but the root, which the Chinese esteem so rare and valuable, that it is sold by weight against silver; it is universally used by the physicians of that country, as a medicine for the great men who alone are able to pay for it, and one of the emperors sent a body of ten thousand Tartars into the woods only to gather ginseng. L'Empereur avoit donné ordre à dix mille Tartares, d'aller ramasser tout ce qu'ils pourroient du ginseng, à condition que chacun d'eux en donneroit à sa majesté deux onces du meilleur, et que le reste seroit payé au poids d'argent fin.

The virtues of this root are in the highest degree of esteem, a decoction of it being a most powerful restorative, invigorating the faculties, dissipating humours, imparting a regular motion to the blood, strengthening the lungs, preventing nausea, strengthening the oesophagus, recovering the appetite, dissipating fumes and preventing vertigo's: Now whether so many valuable properties can center in the tegebar, I leave to the investigations and experiments of the faculty.

bilberries,

bilberries, but the juice thereof is white and sweetish: The Finlanders in Nordland are very fond of these berries, and use them as a powerful antiscorbutic.

Aaker or agerbær, land-berries, derive their name from growing under the grass in the ridges betwixt the furrows, but they are only found in the northern provinces, being of such a nature, like the tranebær, as to require a sharp cold to ripen them instead of heat. In colour and figure they are not unlike bilberries, only something blacker and larger, the taste of them is a pleasant acid. In Sweden, particularly the province of Middelpad, abounds in them, and great quantities are carried to Stockholm, where they are chiefly used to put in wine, like cherries, for a pleasant and cooling summer-draught. Linnæus, in the above cited passage, recommends, that in transplanting them, during winter they should be covered with snow to cherish them, as without this fence they infallibly perish.

Plate X. fig.
c.

Tyltebær a very wholesome and pleasant red berry, growing on the moss in high situations. The stem is short, the leaves small like those of box, the flowers of a lively red. These berries grow so thick that they are plucked off by handfuls, they are in such vogue in Denmark, as to be sent thither preserved for the table, and though their sweetness and acidity be mixed with a bitter, yet this is very pleasant, and greatly promotive of digestion, which has recommended it to be used at tables. Their juice is thick, but when mixed with wine is exceeding palatable and wholesome.

Meelbær.

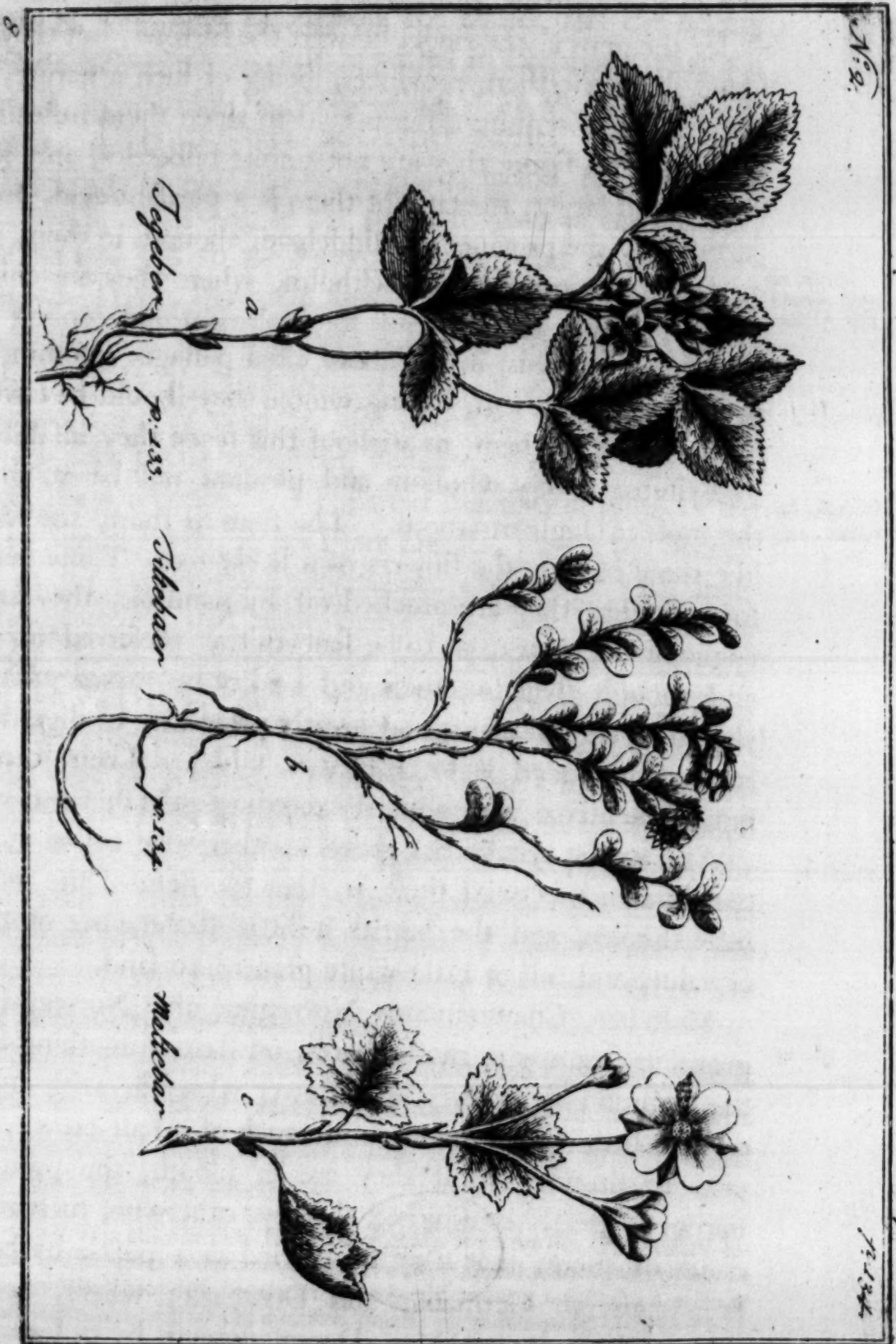
Among the tylteberries grows another tribe called meelbær, all the difference betwixt these is, that the stem of the meelbær is a little thicker, and the berries a little flatter, but of no manner of value, and full of little white grains like sand.

Chamæmo-
rus Norve-
gica.
Plate X. fig.
c.

Moltebar, Chamæmonus Norvegica, the Norway-strawberry, grows in swampy or mossy places, on stems something larger than the common strawberry, the flower whiteish, with a round indented leaf, about the circumference of a half-crown, if it happens to thunder whilst they are in bloom, the produce of the berries is greatly diminished thereby, otherwise, such is the abundance of them, that they are carried as a pickle by barrels, and even tuns, to Germany, and Denmark; where, according to Thom. Bartholin, in Med. Danor. domest. by order of Christian IV. great pains were taken to propagate this fruit in his gardens,

but

NATURAL HISTORY OF THE
MOUNTAINS OF THE
MOUNTAINS OF THE
MOUNTAINS OF THE



Nº 2.

part I.
p. 134.

RECEIVED

THE

LIBRARY

OF THE

UNITED STATES

DEPARTMENT OF

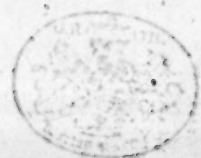
THE ARMY

AND

NAVY

WASHINGTON

1898



but hitherto to no purpose, though I have been informed that in Jutland, in the province of Vendsyssel, they grow spontaneously, but neither so good nor in such plenty as in Norway; in shape they something resemble the mulberry, though not quite so long, of a flame-colour, their original taste is much sweeter, than after exportation, or when kept throughout the winter, tho' the acidity still retains its agreeableness; and is withal so salubrious, that our physicians are unanimous in commending it as an incomparable antiscorbutic. Thus are these, and other berries, together with the before-mentioned scurvy-grass, angelica, trefoil, &c. an ample provision, which, according to the paternal views of the Creator, nature has pointed out to the Norwegians for relief in their scorbutic disorders. Thom. Bartholin says, "*Confectio et spiritus mororum Norvegicarum omnium vota superat. Mori hujus ea in profligando scorbuto deprædicatur virtus, ut eo affectu laborantes, Norvegi amendantur ad virgulta, ubi uberrima hujus fructus est messis, ut illis solis baccis vescantur, testaturque experientia, sanos ad suos post illum reversiones.*" I omit the description given of the moltebær by Simon Paulli, in his *Flora Danica*, page 139. because Lochstor, in his already-cited dissertation, charged it with inaccuracy, and promised one more correct, but was prevented by his untimely death; unquestionably something more authentic concerning the Norwegian plants might have been expected from him, than the little which is hitherto * known, tho' the knowledge of it be very far fetched. However, what I have set down is so far intitled to credit as having experience for its basis, though I must withal observe, that in the figure of the moltebær, the flowers are made a little too big in proportion to their leaves; in the other figures of the Norway vegetables, I cannot discern any considerable oversight, and the greatest care has been taken for their exact resemblance to the originals.

In Medic.
Danor. Do-
mest. p. 160.

De Med.
Norv. suffi.
c. 2. p. 15.

Several kinds of plumbs attain to a tolerable ripeness, which can very seldom be said of peaches and apricocks, it being mere matter of curiosity to plant and estimate their trees, as is in most places here the case with vines.

* In T. 1. p. 56. No. 66. Of Olai Wormii epist. is a letter to Nic. Paschasius, bishop of Bergen, which gives us to understand that the famous Otto Sperling in his younger years, travelled over this his native country for making a collection of Norway plants and vegetables, the loss of which is greatly to be lamented.

Apples and pears of several kinds are found all over the country, and the peasants now begin to apply themselves to the cultivation of them both, with more skill and more diligence; but the greatest part of these are summer-fruit, which ripen early, the winter-fruit seldom comes to perfection, unless the summer proves hotter, and the winter sets in later than usual. In this diocese, Sognefiord, Nordfiord, and Hardanger, are the best parts for the growth of fruit-trees, many of the peasants there being able to clear their yearly assessments from their apples and cherries. Of the forrest-apples, likewise, a cyder is made, but not to any great amount.

S E C T. IV.

Of the woods
of Norway in
general.

But tho' in the article of fruit-trees, Norway must be acknowledged inferor to most countries in Europe, yet this deficiency is most liberally compensated in the blessings of our inexhaustible forests, a blessing of such importance, that in most provinces immense sums are received from foreigners for masts, beams, planks, boards, and the like, not to mention the home consumption, for houses built entirely of wood, beam upon beam, ships, bridges, piles, moles, &c. likewise for the infinite number of founderies, which require such an immense quantity of small-coal in the fusion of metals, besides the demands for fuel and other domestic uses; to which must be added, that in many places the woods are felled only to clear the ground and be burnt, the ashes serving for manure, and sometimes by negligence, in the drought of summer, the fire spreading along the moss, thousands of trees are weakened at the roots, and afterwards blown down by the first high wind. Nor is this all; the peasants also use an infinite number of young trees for inclosures and fences for their houses, gardens, and roads, tho' there be no want of stone to answer that purpose. These, and all other circumstances considered, the want of wood in Norway must have been at least as great as the present abundance of it in most provinces, had not nature indued the soil, even in the most barren mountains, with a most singular fecundity in the spontaneous production of trees; an evidence of which are the many shoots from the smallest fissures of the rocks, which thrive much better than when carefully planted in a good soil.

foil. However, here, as in other things, the difference in different provinces is very great. On the western-coast, some house and ship-timber are exported to Scotland * and Spain, but this cannot come into account in comparison with the exports from Drammen, Fredericshall, Fredericstadt, Christiania, Skeen, Arendal, Christianfand, Christian's-bay, and Drontheim, where the produce of the woods supplies an immense trade; the masts and large beams being floated down the rivers, and the latter divided into boards at the saw-mills. Sometimes piles of it are seen in the ports like little mountains, that one would imagine it must require a very long time to remove them, whereas a single embarkation for England, Holland, France, or Spain, in a few days sweeps them all away; yet in a few weeks these places are again covered with mountains of timber. The saw-works are the best manufacture in Norway, an infinite number of families get a comfortable maintenance from them, together with the felling and floating of the timber. Before the year 1530, saw-mills were not known in Norway, the stocks were hewed down, and with the ax split into two planks, whereas now they are sawed into seven or eight, so that most of the wood was wasted into chips, which is the case to this day in some places, where saw-mills are not yet introduced, particularly at Sundmoer and in the province of Nordland, where great numbers of boats and barks are built of these hewn planks; they are indeed much stronger, but consume too many trees, the greatest part of which is left on the ground to rot. The tenth of all sawed timber belongs to his majesty, and makes a considerable branch of the revenue, Nic. Cragius in Vita R. Christiani III. informs us, that this duty was established in the year 1645, and further, that even in those times, the large exportations to the Dutch, were at that time apprehended to be detrimental to the national timber: "*Regi compertum magnam vim materiæ undique ex Norvegia in varias partes Europæ exportari, ita ut sylvæ ad vastitatem multam*

* The Schot-laft, as it is called, annually exported out of the diocese of Bergen, unless brought under timely restrictions, is a manifest destruction of the forests, as it consists entirely of young pine-trees, all so straight and pliable, that if left to grow to masts, they would yield an hundred rix-dollars each; whereas now they are sold for two marks and a half the dozen, and when larger, about twelve ells in height, the dozen usually goes at five marks, which, exclusive of the wood, of which so much pains is taken to clear the country, does not so much as pay for the labour.

redigerentur. Quod malum ne licentia nimia exitiosum regno tandem foret, edicto statim vetitum, materiam quoquam, nisi in Daniam evehi." Upon this, the Dutch made a heavy complaint to the emperor, who at that time was their sovereign, and he accordingly sent remonstrances to the king, but received for answer, that the necessary preservation of the timber required such restraint, especially as the peasants totally neglected tillage and husbandry, for the more easy way of maintaining themselves by felling of timber; Deferente plebe rustica agrorum cultum, præ faciliore opera materiæ cædendæ, jacere possessiones steriles et infrugiferas.

These complaints are heard in many places, for altho' the increase of tillage be at present double to what it was at that time, yet on the other hand, from the increase of the inhabitants, and division of estates among several sons, the northern peasants still chiefly give themselves to timber-labour. This could not possibly long subsist, without that remarkable fecundity in the soil for producing trees in those places, where the young trees are permitted to reach their full growth, by the prudence of the proprietor, or by the situation of the wood, rendering the exportation of it difficult; for it is my opinion, that more wood rots in Norway, than is burnt in a whole year in Denmark. Indeed the vast and thick forests seem to contradict any apprehensions that ever the country can be in any want of common timber; but as to the fir-trees, and oaks, it is to be feared that posterity will be at some loss for them, unless the forest-laws are more strictly executed, particularly with respect to young trees, of which the continual exportation must be attended with very bad consequences. The best wood for timber (for of other wood there is plenty every where) is in the following provinces; Saltan, Helleland, Romsdale, Guldbrandsdale, Osterdale, Soloe, Valdres, Hallingdal, Sognfiord, Telemark, the lordship of Nedene, Buskerud, and in the counties.

S E C T. V.

A catalogue
of the Nor-
way trees.

As to the several species of trees, of which the woods in Norway consist, the principal are the fir and the pine-tree. However I shall endeavour to enumerate them all, according to the
I best

best of my knowledge, in the same method, in which I have already delivered a catalogue of our vegetables.

Alm or Elme, *Ulmus*, the elm-tree, is not very common here, but grows to a pretty considerable height. The bark is dried, grined, and mixed by the poor among their meal; it is likewise boiled and washed in meal*.

Afald, see Oxel.

Ask or Esk, the ash grows almost universally here. Among divers other uses of this tree, the peasants distil a balsam from it, called Aske-Smittel, or Aske-Smalt, which every man knows how to prepare, and serves for a domestic medicine both in internal and external cases. Dr. Lochstor, in his *Differtat. de Mædic. Norv. suff.* p. 16. bestows the following encomium upon it; *Euporiston pro utroque scopo Norvegis est oleum empyreumaticum, vel potius balsamum, vulgo Aske-Smalt dictum, è fraxino paratum, quod tam interne datum, quam externe adhibitum mirabili se ubique commendat effectū.*

Barlind very much resembles, both in kind and appearance, the foreign yew-tree†, but seldom grows so large, and is rather of use in hedges, than for single pillars or posts. The trunk, which is of very moderate bulk, is strong, and was formerly made use of for shooting-bows. The veins of this tree are so fine and reddish, that the makers of violins in Hardanger, use it for that and other musical instruments, and the joiners apply it to the purposes of fineering and inlaying. The young shoots are sometimes carried to Denmark, to be planted in the gardens of persons of distinction. There are beautiful hedges of it near Fredericsberg.

Beenved is a tree not very common, of the same kind with the Privet. It is made use of for fine work, being hard and solid, which very well suits the cutting instrument used by the joiners and turners in Norway. It grows on the highest mountains. The peasants make a decoction of this wood, which is esteemed good for a consumption.

* This powder of the bark of elms is boiled up with other food to fatten hogs, who thrive so much upon it, that the virtues of the bark of elms are even proverbial here.

† This tree is divided into two kinds, the summer-yew, whose leaves are somewhat lighter, and the winter-yew, which is of a darker green. Our Norway Barlind is of the latter kind.

Birk, birch, grows in most parts, and in the greatest plenty. It is of two kinds, the common birch, and a lesser sort with small thick leaves. Birch is made use of here for various purposes *. It is more generally used for fuel than any other wood, and is carried to the great towns for that use, and sometimes exported abroad from thence. But the bark is of greater utility, and that in two respects. The extreme white bark, which is distinguished by the particular name of Never, or rind, and sometimes grows again upon the same tree from which it hath been peeled off, provided this was done carefully, is so fat and firm in its parts, that it will escape putrefaction for many years, even in the dampest places. It is on account of this quality, that every peasant spreads it over the fir planks with which his house is covered, and upon this Never he lays green sword or turf to a considerable thickness for the sake of warmth. The inner, or the dark brown bark, is applied, like the bark of oaks, to tanning of skins and hides, and even fishing-nets and sails, which it renders more durable. The Scotch likewise use it for tanning their hides, and pay eight Danish-shillings for thirty-six pound weight of it. Besides all this, those who like it, draw a wholsom and pleasant juice from the trunk of this tree, as in the eastern countries the same is practised with palm-trees. They bore a hole in the trunk †, and the juice distills into a flask hanging under it, without the least damage to the tree, provided the hole is immediately stopt by driving in a wooden peg.

Boeg, beech, is rather scarce here, except in the counties of Laurvig and Jarlsberg. And it does not appear, that beech grows spontaneously at a certain distance northward, for according to the observation of Linnæus, in the transactions of the Swedish academy for the year 1739, vol. 1. p. 22. it doth not grow in

* Valbirk, the maple-tree, which springs from the roots of some birch-trees, is used in several neat and polished works, being hard, firm, veiny and spotted, and was thought beautiful, when heretofore the drinking mugs were made of it.

† Dr. Buchwald, in his specimen Botanicum, p. 51. says of this birch-juice, "in scorbuto, ictero, podagra, nephritide, calculo, ac cunctis aliis chronicis morbis tartareis, tam præservativum quam curativum singulare est remedium." A certain friend assures me from his own experience, that from the buds of birch, gathered just when they are full of their resinous and viscous sap, and distilled with birch water, or for want of this in other good water, may be drawn a milky juice, which when it subsides and clarifies, leaves in the bottom and on the sides of the glass, a pretty thick balsam, which being duly separated is in point of consistence, colour, smell and taste, exactly like the precious, tho' frequently counterfeited balsam of Mecca.

Sweden beyond East and West Gothland, consequently not very far north.

Eeg, oak, the strongest and most durable of all trees, was heretofore in great abundance in this diocese of Bergen, as well as elsewhere, but is of late become scarce. The best oak-forests are in the diocese of Christiansand, particularly in the lordship of Nedene, from whence great quantities are every year carried to Arendal and Christiandsand, for ship-building, and many ships are loaded with it every year for Holland, tho' the exportation be prohibited. Norway-oak excels that of all other countries, except the Danish, which is preferred to it. A decoction of oak-leaves in beer is used by the peasants in Norway, as a cure for the gout or rheumatism, by dipping a cloth in the decoction, and applying it warm to the part affected.

Elle, which is likewise called older and oor, the alder-tree, is of two kinds; viz. the roedoor, or red alder, this is the most common, and the leaves of it are somewhat rough; and Svartoor, black alder, whose leaves are smooth and shining; the latter grows chiefly in marshes and other swampy grounds. The twigs of it are judged wholesome food for the sheep in spring, as it expels the water, which is apt to lie in their bodies, and to cause a kind of dropsy. The bark is used for a black dye. If it happens to snow after this tree has put out its leaves, then the leaves turn brown, dry and wither, together with the trunk, which is occasioned by a species of small worms, which are said to be in the snow, and affect no other tree. But if it be cut down immediately, the root will shoot again.

Enebær-tree, (which is here commonly called sprake, and in other parts of the country, brisk and bruse) the juniper-tree, grows in abundance almost every where, and by the spreading of its branches over the ground, serves to cover and cherish the young shoots of firs and other trees, but at the same time kills the grass. The body of this tree, which seldom exceeds six or seven ells in length *, is used for poles and hedge-stakes, as also for paling, it

* In the church of Trovær, in the province of Nordland, and district of Senjen, there are, according to common report, two pillars of juniper-tree eighteen ells high from the ground, which, if true, and if the pillars are not composed of several pieces, is very extraordinary. It is more notorious, that the trunk of a juniper-tree is sometimes thick enough to be sawed into small boards, which are used for chests and cupboards, and always give an agreeable smell in a room.

being on account of its fatness more durable than any other wood. In Nordfiord and elsewhere, a very valuable juniper-oil is extracted from the fruit, and sometimes exported to Holland. The same use is made of the berries, but not so frequently now as heretofore.

Esp or bever-esp, the aspen-tree, whose leaves shake and tremble at the least motion. The twigs are, like those of the birch and alder-tree, given to the cattle, particularly horses, when other fodder is scarce. This tree, which in other respects is very weak and tender, proves to be almost incorruptible, in the water or humid ground, when it is laid down without being stripped of its bark, and is therefore much used for water-pipes and gutters under ground.

Fyr, or as it is here called fure, the fir-tree, is of two sorts; the red and hard fir, which grows upon the mountains, and contains the greatest quantities of resin; and the whitish sort, which grows quicker in low and moist grounds, but is of much less value, consisting only of the bare timber. The fir-tree in general, which grows almost every where in Norway, is the richest produce of the country; for this single tree yields annually at least, I speak within compass and from the strongest assurance, above a million of rixdollars, especially if we include the advantages of the saw-mills, and the masts, some of which are sold from one hundred to two hundred rixdollars each *. These trees, excepting those on the mountains, from whence they cannot be so easily removed, are now seldom suffered to grow so large as in former days, of which we have the strongest evidence in modern houses, for a peasant's apartment, which heretofore used to be raised by four sticks of fir-trees laid upon each other, requires now commonly seven or eight. The richness of the sap of the red fir-tree may be concluded, among other arguments, from the age of some of our Norway-peasants houses, which are supposed to be three or four hundred years standing, if not more. We even read in Mr. Jon. Ramus's history of Norway, that in the farm of Næs in

* A choice mast-tree, which when standing may be estimated at sixty, hundred, or hundred and twenty rixdollars, cannot, after it is cut down, be conveyed to the sea-ports for less than double the prime cost; for besides the many other trees it requires to form a kind of bed for it to float upon, lest it should be torn to pieces by the rocks, sometimes an hundred trees or upwards must be fell'd to make a way for it, and laborers are employed to hawl it in places impassable for horses.

Guldbrandale, the house is still subsisting, in which king Oluf lodged five nights in the year 1022, above seven hundred years ago, when he took a circuit round the kingdom to convert the people to the christian religion. From the roots of the fir-trees the peasants burn tar, even an hundred years after the trunk has been cut down. This tar is a very profitable commodity, and so excellent in its kind, that bishop Berkley, in his treatise on the virtues of tar-water, recommends the Norway-tar in preference to any other. An eminent merchant in this place has assured me, that the dispensaries in London apply to him yearly by letters for forty casks of tar, the produce of Nordfiord, which is of a more reddish colour than any other. In like manner the fir-trees from Norway and Sweden are in much higher esteem, than trees of the same name and appearance in the warmer countries, in Spain, for instance, about Tortose, in Tuscany, in Dalmatia, and other countries on the Mediterranean, which may indeed content themselves with their own for want of better, but could not sell them in their own ports, if a Norway-man should import a cargo of ours. There have been attempts made to sow the Norway fir in England and other parts, but the difference of soil and climate will not suffer the trees to equal those of Norway. In respect to the soil, it is not the good, rich and black earth, that favours this tree, nor the clay-soil, but rather the gravelly, sandy, or moorish lands. The method of sowing other trees will not succeed with this. It chuses to grow independent, and to sow itself at pleasure. The best method therefore is to hang up here and there, on a pole erected for the purpose, some of the ripest pine apples, by which the small subtil seed which lies concealed between the knots, may be thrown out by the motion of the wind, and drop wherever that carries it. In the fens, the marrow or resin of the fir-tree is naturally transformed into an incense, which may be called the Norway-frankincense, and is found in the fenny grounds. The buds or pine-apples of the fir-tree, boiled in stale beer, make an excellent medicine for the scurvy, and not so unpleasant to the palate, as the tar-water, tho' in effect of the same kind. In Sundmoer, and perhaps in other parts, some branches grow upon a certain species of fir-trees, which appear quite monstrous and strange in comparison with the rest, for they are not

round, but entirely flat, and shaped in such manner, as almost to resemble the horns of a Deer.

Gran, the pine-tree, is, together with the fir, the most universal wood of this country's growth. It is more beautiful than the fir, in figure, height and colour, but far inferior to it in sap and strength, which occasions the boards or planks of it to be sold at a lower rate. The Norway peasants have so little mercy upon their pine forests, that they seem to think it their duty to destroy them, insisting upon it, that they cannot possibly be extirpated in the vast tracts of land, which continually produce a fresh supply. In the spring, when forage is scarce, the peasant is permitted to cut thousands of young pines, but in autumn he is not allowed to give his cattle more than the small shoots.

Hage-forn, the cornel-tree, and sloe-forn, the sloe or bullace-tree, grows indeed in these parts, but is not planted in the green hedges, as in other parts, for the Norway peasant is not dextrous at planting, and thinks it a merit, if he does not destroy the free produce of nature.

Hassel, hable-trees, are here pretty large, and in such abundance, that it is no uncommon thing for a hundred tun of nuts to be exported from Bergen alone. On the other hand, the walnuts here are not of a spontaneous growth, but must be set, when they thrive very well, especially in the barony of Rosendal.

Hyld, elder, with its salubrious berries, is also of Norway growth, but is neither here nor in Denmark, esteemed or made use of according to its worth. *Sambucus aquatica*, in Danish called Vand-hyld, water-elder, the flowers whereof look like snow-balls, and upon that account in German are called snowball shrubs, is likewise to be met with though not every where.

Ivenholt, or ebentra, ebony, is by J. L. Wolfe, classed among the trees which grow in Nordland, under the mountain of Kolen, but being without any additional confirmation of this, I cannot deliver it as a certainty; I must observe, however, that the following words of Wormius, may have given rise to this opinion, though he delivers himself with some doubt; "Ab hoc ebano fossili diversum est, quod in islandia reperitur, et laminatim eruitur, colore nigerrimo, quandoque subfusco, ponderosum et fragile, exsiccatum ubi fuerit, quanquam mercator, qui ejus mihi copiam fecit,

lentum adeo et flexile esse, cum primum è terra eruitur, retulerit, ut viminis instar, in quamvis partem trahi possit ac flecti. Fibris constat obliquis ex nodis hinc inde, plane instar radicis majoris ejusdam arboris. In iis locis islandiæ, ubi magna copia eruitur, terra ad duas ulnas effossa, nullæ plane sunt arbores, aut fuisse unquam, animadverti potest. Quo circa nescio, an eorum probari possit opinio, qui existimant, hic olim sylvas fuisse, quæ relictis radicibus, incendio conflagraverint. Radicum vero truncos à succo subterraneo vitriolato colorem nigrum contraxisse verosimilius. Mus. Worm. p. 169.

Lind, lime-trees, great quantities of these are found in certain places, both with large, clear, and small dark leaves. The peasants with the bark make very elegant butter-baskets, or other vessels for the carriage of the butter; likewise lines for husbandry, and also for fishing.

Lon, acer major, the maple also grows here, but little use is made of it.

Piil, willows of several kinds are to be found in many places, but made no account of, except by the goats, who feed with pleasure on its juicy and bitter bark; though of one kind called *salina*, the bark is used for tanning skins; the broad-leaved kind, the leaves whereof underneath are woolly, goes here by a very long and strange nick-name, *Traet somfanden flaaede geden* under, i. e. the tree under which the devil flead the goats. What traditional fable gave occasion to this, I know not, but probably it arose from hence, that as the goats delight in stripping these trees, as has been said, some one has conceived, that the devil by way of retaliation, under this tree strips or fleas the goats, in their turn. But whilst I am writing this, I have received from an ingenious hand a more probable conjecture on the causes of this name, that several small threads, or filaments like goats-hair, lie betwixt the wood and the bark. He further informs me, that a decoction of these fibrillæ is of a singular virtue in curing the scurvy. Whether this tree is to be found in other countries I cannot say *.

Rosentrae, the rose-bush, bears here, as well as in other places, red, white and yellow roses, both double and single.

* Some attribute the properties of this tree to the *sambucus aquatica* before-mentioned, but how justly, I cannot determine, for want of personal experience.

Ronne,

Ronne, the wild *Sorbus-sylvestris*, the wild Service-tree, grows every where, even on the parched sides of the mountains, nourishing with its berries, not only the field-fares or cock-thrushes, of which we have many, and in great perfection, but even the bear, though the latter, generally, to the ruin of the tree, the weight of his body breaking and damaging the tree in his climbing up. The young twigs are gathered with the berries on, and used medically, in winter, against the belly-ach.

Tindveed, the name of the tree called the Spina-Christi, or Christ-thorn, is pretty common, and being an ever-green, is frequently planted near houses.

Oexel, or Axel *forbus terminalis*, a kind of service. This tree is one of the particular natives of Norway, and little known to foreigners. Mr. Christian Gartner, who visited several countries, and had thorough knowledge in his profession, says, page 47, of his *Horti Cultura*, that he first met with it in counsellor Shultz's garden in Drontheim, on which account I have annexed a draught of one of its branches with the leaves and flowers; Linneus makes the following mention of it, *Oexel, cratægus, foliis ovalibus inæqualiter ferratis*, Hort. Cliff. 187. *Cratægus scandica, foliis oblongis, non nihil lacinatis et ferratis*. Cels. Upf. 17. It grows in Oeland and Guland (Gothland) but except in Sweden and Norway, it is hardly to be met with growing spontaneously*. Some places in the neighbourhood of Bergen produce this tree, but not in great numbers. The stock and branches bear some resemblance to the service-tree, but bend more; the bark is of a greyish brown, and veined; the leaves of a finger's length, half as broad, and indented, the points towards the extremity being small, but the indenture within the leaf is so deep as to make the appearance of other distinct leaves on the same stem. At the extremity of every branch, and betwixt three leaves, hangs a bunch of thirty or forty berries, oblong, red, and, when ripe, distinguished with a black speck; their stones small; the juice red; and when infused in wine very pleasant. Valerius Cordus, in his Dispensary,

See plate ix.

Transactions
of the Swe-
dish Acad. of
Sciences for
the year
1741, Book ii.
p. 93.

* In some few parts of Germany, especially in the district of Fouringen, grows a kind of tree, which is there called Arlsbeer-tree, and which by its description, has a great affinity with our Oexel. See Allgem. Œconom. Lexicon. p. 124.

commends these berries, as a cooling, and at the same time an astringent, medicine †.

S E C T. VI.

Among the vegetables of this country, we must further class what by many is looked upon only as a conflux of effæete ordure, but is in reality, and especially when examined thro' a microscope, a regular vegetable, furnished with root, seeds, and leaves; I mean the several kinds of moss, with which this country is overrun, not only on the meadow-ground, where it is very detrimental, but also on the trees, from which, after a shower it is easily detached, tho' at other times adhering very closely. This moss, upon a narrow inspection, is very different in colour, white, grey, brown, yellow, black, and speckled; in figure, being either entangled like wool, or with long filaments; or again with leaves regularly disposed, tho' of different figures, and it is sometimes full of small round capsulæ, as receptacles of the seed *. This mean and despised vegetable, which seems to die under a long continuance of heat and drought, immediately recovers new life from the rain, and is not made in vain by the wise Creator, it being the support and fodder of many thousands of rein-deers, on the barren summits of the mountains, thro' all the severity of the winter; they remove the snow with their feet to get at this delicious food; and they can neither thrive nor live to any time, if, as has been often tried, they are removed into another country

Moss on trees
and stones.

† Thus has the Sovereign of nature liberally dealt out particular vegetables and trees to every country, according to the climate and soil thereof, and the necessities of its inhabitants.

Nec vero terræ ferre omnes omnia possunt.
Fluminibus falices, crassisque paludibus alni
Nascuntur. Steriles saxosis montibus orni,
Littora myrteis lætissima. Denique apertos
Bacchus amat colles. Aquilonem et frigora taxi
Aspice et extremis domitum cultoribus orbem,
Eoasque Arabum pictosque gelonos
Divisæ arboribus patriæ.

VIRGIL. Georg. Lib. II. Ver. 109.

* J. Chr. Buxbaum in Commentar. Acad. Petropol. Tom. III. p. 271. Treats of several kinds of moss, and particularly gives the following account of a Norway-moss: "Genuina musci species est muscus Norwegicus, umbraculo ruberrimo insignitus, musci Petrop. quem Tournefortius incongrue Lichenibus accensuit et Lichenem capillaceo folio, elatiorem pelvi ruberrima vocat, deceptus forte a scuto, quod hic in summo fert pediculo, quum sciret multos ex Lichenibus esse scutigeros. Sed hoc scutum in hoc immusco vires gerit calyptræ, summo nempe capitulo pyri-formi positum, et est calyptra quasi expansa.

PART II.

Qq

where

where they may have their fill of the best grafs. Without plenty of mofs, and seeking for it in their natural freedom, they fenfibly linger away. Befides this, our peafants make a decoction from many kinds of mofs, which is difpofed of to the dyers; this is here called *Borke*, and makes a good red and brown dye for vadmél, the coarfeft fort of cloth ufually worne by the peafants. There is moreover a certain kind of yellow mofs hanging on the branches of firs and pines, which is very venomous, yet applied to a neceffary ufe, for being mixed in pottage, or with flefh, as a bait for the wolves, they infallibly die of it.

Of fungous vegetables, which are called by the general name of *Skuroe-harre*, or *Champignons*, i. e. mushrooms, feveral forts are to be found here, as in Denmark and other places, particularly thofe which are dried and fold by the name of *Markler* (the fame which in England are called mushrooms.) Thefe grow in the neighbourhood of *Buskerud* in *Hedemark* and other places, and are bought up by the curious to fend abroad ‡.

C H A P. VI.

Of the Sea-Vegetables of Norway.

SECT. I. *Sea-vegetables little known to us.* SECT. II. *Several fpecies of fea-grafs.* SECT. III. *Various kinds of fea-trees.* SECT. IV. *Great and fmall corals.*

S E C T. I.

Sea-vegetables little known to us.

HITHERTO, I have, to the extent of my knowledge, given an account of the land-vegetables of Norway. As to thofe of the fea, it would give me pleafure if I could gratify the reader's curiofity with fome new discoveries in this latent part of the kingdom of nature. However, the little I have to offer is grounded on my own experience in voyages, and the reports of intelligent fea-faring perfons. But left this fhould be thought a fubject of no utility, I fhall introduce it with the following paffage from

‡ This kind of fungus is ufually found under birch-trees. They are of a reddifh colour, with little white fpecks, penetrating through them, fome call them *Flue-fvamp*, i. e. fly-fponge, they being boiled in milk and fet out to deftroy flies; this fungus being a ftrong poifon.

that ingenious naturalist M. Anderson of Hamburg: "It is to be lamented that the botanists, especially the Germans, for want of opportunity, being remote from the sea, have not, nor can apply themselves with a precision becoming the subject, to make a collection of the marine-vegetables about this country, distributing them in proper classes, with descriptions of each. For since I have entered upon these speculations, and collected as many kinds as I could, they appear to me, matter of fresh wonder and most exquisite delight to a devout naturalist, in the consideration of their inexpressible, and to a stranger incredible, variety, figure, colour, production, without roots, &c. and when I reflect, that nothing but what is good and useful comes from the hand of the wise Creator. I will affirm that these vegetables, however useless they may be accounted, not only afford nourishment to innumerable living creatures, but might for the most part be serviceable to mankind, not only as food, especially in time of necessity, but likewise for powerful medicaments; did not our infatuation for what is foreign and costly incline us to under-value them. Mr. Martin, in his description of the Western Islands of Scotland, a book well worth reading, has, in page 148, &c. thrown together some very valuable observations upon them, which he made among the inhabitants of those islands, who live in the utmost simplicity, and in a rational enjoyment of the little, which the author of nature has bestowed on them; instances which should raise a blush in the effeminate and luxurious." Thus far Mr. Anderson. As part of the inhabitants of the sea bear in their figures a resemblance to those of the land, as is seen in the sea-cow, the sea-horse, the sea-dog, and sea-hog, &c. so fishermen, and divers who have opportunity of knowing these things inform us, that the eminences and declivities in the sea, like the mountains and vallies, are over-grown not only with sea-grass and plants of several kinds, but that likewise they produce bushes, trees, and coral-shrubs. In the chapter on the waters, I have already quoted the testimony of Kircher, grounded on the information of Arabian fishermen. The bottom of our northern-sea, likewise affords variety of such marine plants, some of which must be unknown to the curious in other parts, and for their satisfaction I have caused exact figures of the most remarkable ones to be annexed.

Account of
Iceland,
Greenland,
and Davis's
Streights.

Chap. xi. § 1.

But,

But as it is not my concern to assign proper appellations to these marine vegetables, so to distribute them into their respective classes and genera, with that accuracy I could wish, is, I confess above my capacity. I shall only, agreeably to their figures, make two general divisions of them into herbs and trees; the third class being the corals or stoney vegetables, which by some are confounded with the sea-trees *. Mr. J. C. Buxbaum, in *Commentar. Acad. Petropol.* among other observations on marine plants, speaks as follows, “ *Plantæ submarinæ paucæ fuerunt antiquioribus notæ botanicis, quarum numerum valde auxerunt Rajus Plukenetius aliique, qui his observationes suas communicarunt. Distinxit in aliquot has classes modo laudatus Rajus, sed si accuratius inspicias, ipsum invenies confusum, nullos veros terminos constituentem inter fucos et algas et muscos marinos, quæ illi promiscue nunc sub hoc, nunc sub illo nomine proponuntur, meliorem plantarum submarinarum in genera certa divisionem debemus Tournefortio, qui tamen in eo reprehendendus, quod sub fucorum et corallinarum nomine, plantas inter se parum convenientes comprehendat.*”

S E C T. II.

Several kinds
of sea-grass.

Since my arrival in this country I have made a collection of vegetables growing in the sea of Norway, and by it I perceive, that what is commonly called tong, sea-weed, or in Norway, tarre-alga; which is partly found growing on its root †, partly detached by the wind, and by the agitation of the waves is drove ashore, or among the appertures and corners of the rocks, is sometimes green, sometimes of a dark brown, sometimes narrow and flat, like a blade of grass, and two or three ells in length, sometimes slender and round, but much longer, I myself having pulled up a piece of no less than ten ells, consequently, they exceed many trees in height, and even this might possibly be one of the short-

* In some parts at the bottom of the red-sea, the coral-trees gradually increase to such a degree, that the vessels and boats are put to no small difficulty to clear their way through them.

† So by way of an analogy, I call those short stems by which all those vegetables are connected to some stone or other, which generally is drawn out along with the vegetable; for properly the sea-vegetables have no roots, being on all sides surrounded with their alimentary matter, and thus standing in no need of a root to imbibe their nutriment, so that the entire plant may be said to be a root.

est;

est; sometimes they are found with a short, roundish stem, and leaves about two or three fingers broad, with small semicircular indentures like the oak leaf, sometimes they are longer, and at the end resemble peacocks feathers; sometimes plain, sometimes scabrous, with hollow tubercles, but, as far as I could find, without any seeds in them. A sea-weed is sometimes found here, with leaves of such a length and breadth, and withal even and smooth, that I do not know of any of our land vegetables to be compared to them; I have taken out leaves four ells and a half long and one in breadth, and so perfectly even and smooth, that at first sight a stranger would have taken them for green sattin; and among these weeds, the lobster finds both food and shelter. Whether this tarre blossoms like other vegetables, I cannot affirm from my own knowlege, but a person of curiosity has assured me, that he has seen the flowers swimming on the surface of the water, and that they resemble white lilies; and promised at the same time to procure me some. I here mean only the genera, not doubting, but upon further search, several particular species of them may be found on the coast of Norway, and other coasts, especially in Iceland, where the poverty of the inhabitants has taught them to turn the sea-weeds to various uses, every kind according to its nature, even to the grinding it to a kind of meal ^{Its use and benefits.} for gruel or pottage, which at the same time proves a gentle cathartic *. The peasants on the sea-coast in these parts, who understand their business, make use of sea-weeds for manure in the improvement of their ground, and in the province of Nordland, where in summer-time the cattle find plenty of pasture on the mountains and among the meadows, but where on that account they are the more pinched in their winter fodder; it is a common practice to supply this scarcity with dried tang, and likewise with the heads of cods and other large fish bones; they also make what they call a caw-soup, of which the best ingredient is tang or sea-

* Concerning the species of the alga saccharifera as it is called, which when dried, looks and tastes as if sugar had been strewn over it, and among the Icelanders, in many cases, is used for sugar. See Thom. Bartholini Acta medica, Hafn. Vol. III. p. 174. Vol. IV. p. 33. Multa saxi marinis adhæret algæ copia, quam vere colligunt, aliquo tempore interjecto album acquirit colorem, cujus est etiam in commendatione sapor, cum dulcedine non inferior sit saccharo. Hanc quoque cum butyro comedunt Islandi. See also p. 159. relat. Borrichii.

weed. * In England and Scotland, where this vegetable is generally called clep, the poor people on the coasts turn it to a good account, burning great quantities of it to ashes, for which they are sure to meet with a market at the glass-houses; likewise by reason of the saline particles contained in these weeds, they are boiled for pot ashes, and the sediment is known to be a good manure.

S E C T. III.

Sea-trees.

Besides these smaller marine products, plants or weeds, the ocean here produces various species of large vegetables, which are known by the name of sea-trees, and though of such as grow in a bottom, a hundred or two hundred fathom deep, none except young shoots can be drawn up entire, yet the nets, or lines of the fishermen entangling in the tops of such trees, some of the lesser branches are torn away and pulled up to the surface; and these branches are such as may be concluded to come from large trees, I having one seven inches diameter, though indeed it is the only one of that dimension, the others being but two inches and a half or under, like the slenderest shoots of cand-trees. If I were better acquainted with the latter, it would enable me to undertake a comparison betwixt the congenial products of the earth and water, and thus afford higher entertainment to those of my readers, who have a taste for botany. But as Burgermaster Anderson, in the passage above cited, corrects the great deficiency herein, I shall add a short description of those in my collection, which were all drawn up from the bottom of the sea along the coast of Norway.

Use of them.

I must previously observe, concerning the use and benefit of sea-trees, that the peasants hold them indiscriminately to be very serviceable against a diarrhoea, in which, however, they may be as greatly deceived, as they too often are in their superstitious practice of hanging up a branch of a sea-tree in their houses, as a kind of talisman or preservative against fire, inferring, in their way of

* Some also accustom their swine to eat the sea-weed, and for them it is likewise boiled, being otherwise too hard of digestion; more particulars on the use of it are to be met with in the Swedish transactions, worth the knowledge of the industrious farmer, who lives near the sea, and is for making the most of every thing.

part.

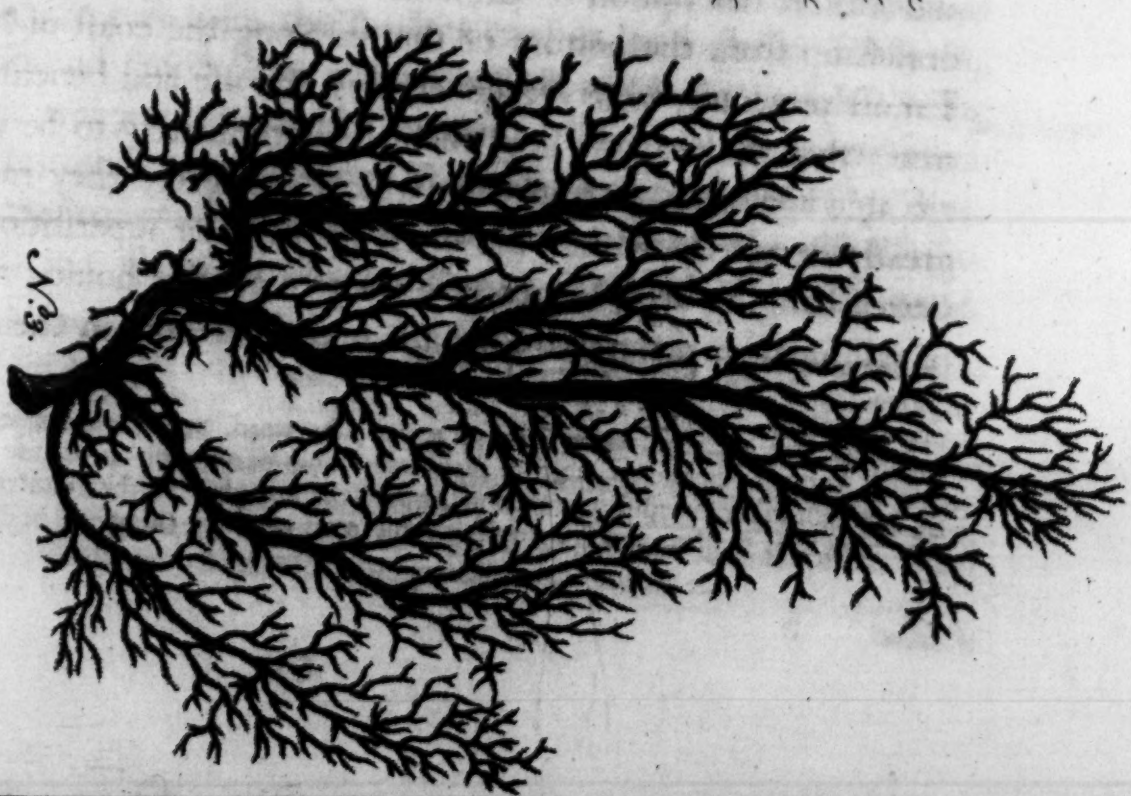
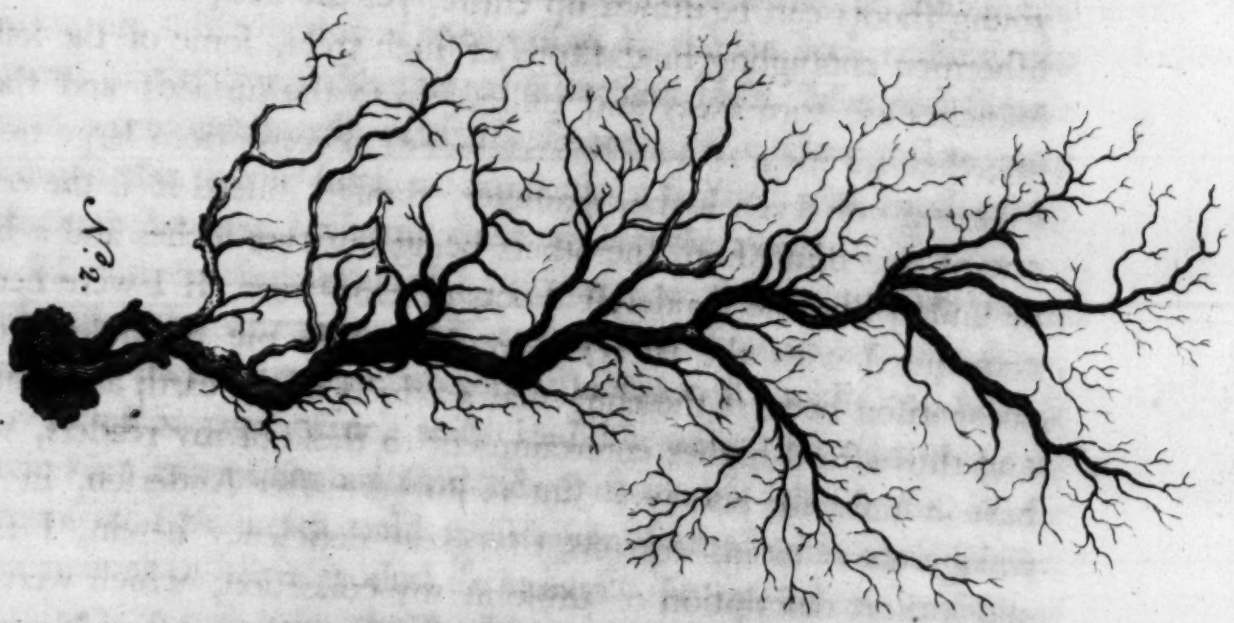
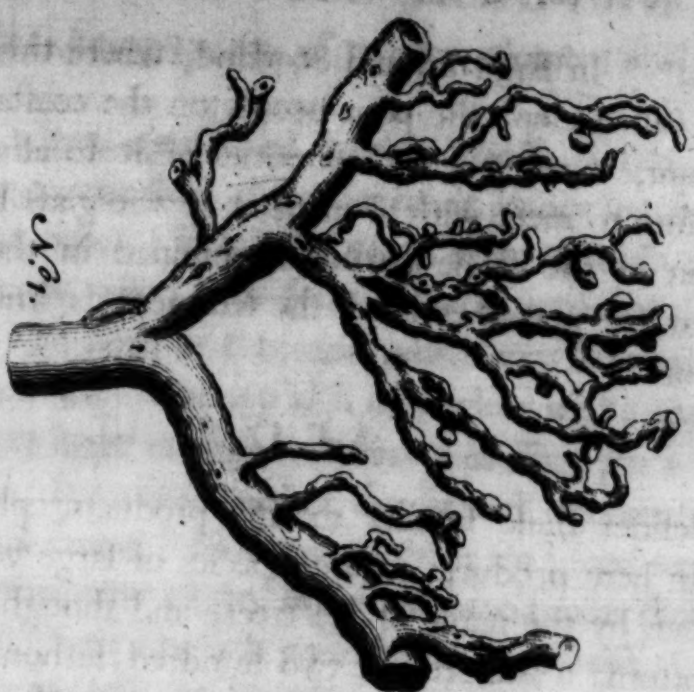
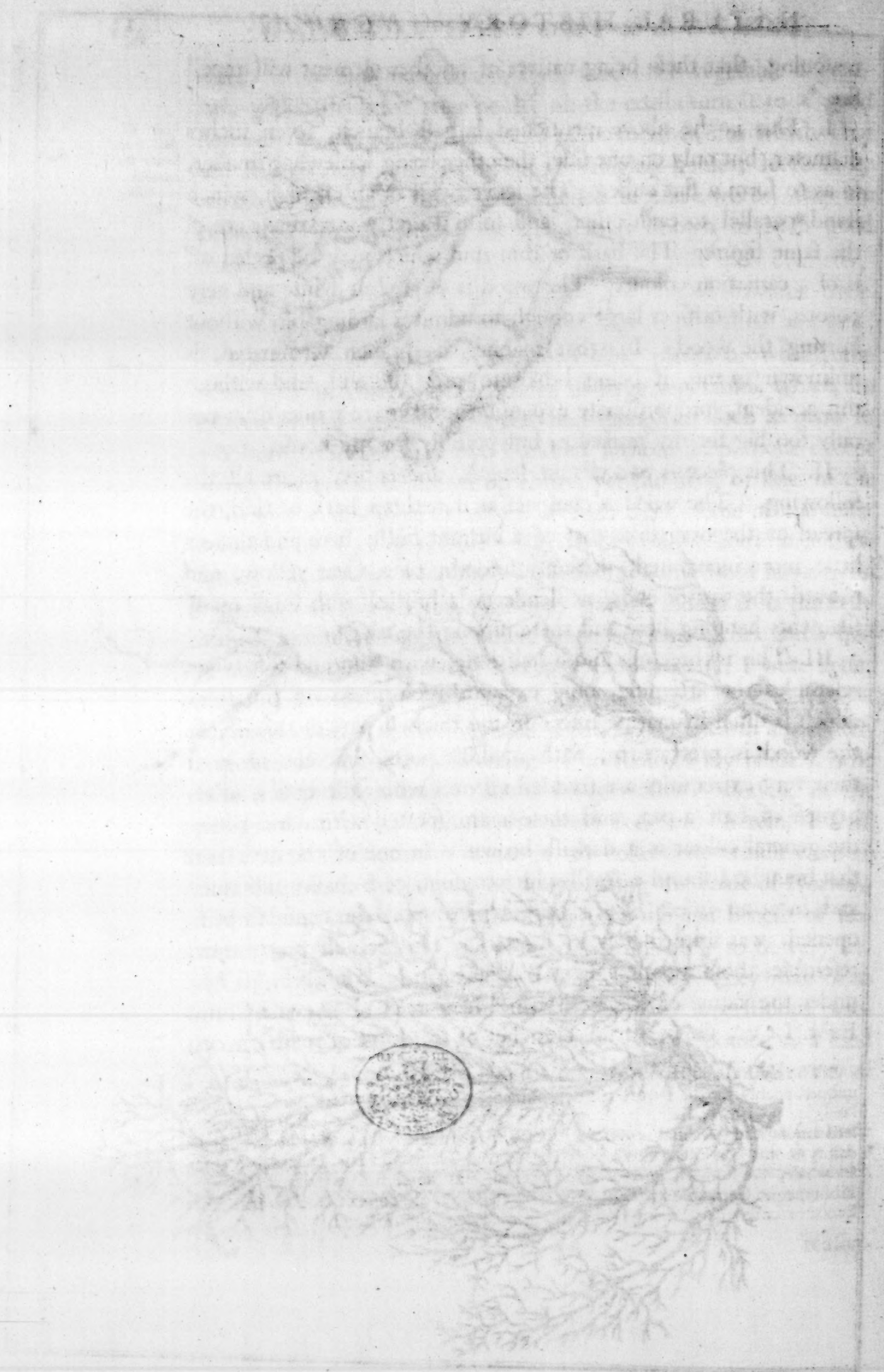


Fig. 1.

See also



reasoning, that these being natives of another element will repell fire *.

I. This is the above-mentioned largest branch, seven inches diameter, but only on one side, the other being somewhat smaller, so as to form a flat cube. The lesser twigs of an ell high, which stand parallel to each other, and form a pretty intexture, are of the same figure. The bark or thin rind which may be peeled off is of a carnation colour. The wood is of a clear white and very porous, with orifices large enough to admit a larding-pin without hurting the wood. In what manner the branch terminated, is unknown to me, it being broke towards the end, and without this accident, proportionate expansion must have render'd it not only too big for my musæum, but possibly for my house.

Plate XI.
And from
hence the
number
according to
order.

II. This piece is two ells in length, and entire, as are all the following. The wood is compact as if without bark or rind, the spread of the twigs like that of a currant bush, here and there a little more incurvated, perfectly smooth, of a clear yellow, and towards the tips or ends, as slender as a bristle, with small mossy filaments hanging here and there among the twigs.

III. This is three ells and a half long, with thin and soft twigs, resembles the *artemisia*, only expands itself more on the sides, which is usual in marine trees: In the thickest part of this branch the wood is pretty firm, with invisible pores, but the twigs to their very extremities are studded all over with little bosses, of the bigness of half a pea, and these again spotted with dark bosses; the general colour is a darkish brown. In one of the cavities of this branch, I found a small white capsula, of a chalky substance, and in it an insect like a bug, which upon the capsula's being opened, was immediately in motion. This branch pretty much resembles those mentioned by Wormius, in his *Musæum*, p. 234. under the name of *Plantæ Marinæ facie resedæ*, likewise Clusius *Exot. L. VI. C. 6*. In the branches of this kind of marine wood,

* The natural and proper use of these sea-trees, and the like marine vegetables, is unquestionably for the retreat and nourishment of the fish; of which, some, as on the land, are predatory, living by slaughter; whilst others of more peaceable dispositions, feed among the trees and vegetables, which are particularly known to be an exquisite dainty to the fish called *Brosmer*. The learned Theodore Hase, mentions a north-sea whale, the stomach whereof being opened, was found full of tang or sea-weed, *Bibliothèque Germanique*, Tom. XV. p. 157. Thus are none of God's works superfluous or unnecessary, though often disregarded or not understood.

which

which is the most common in these seas, is often found the sea-star, which shall hereafter be described under the name of *Stella Arborefcens*, or, if my fancy may take place, of *Caput Medusæ*, and this creature from its delight in this vegetable may be conceived to make it vital food, at least I have met with it in several branches of this species.

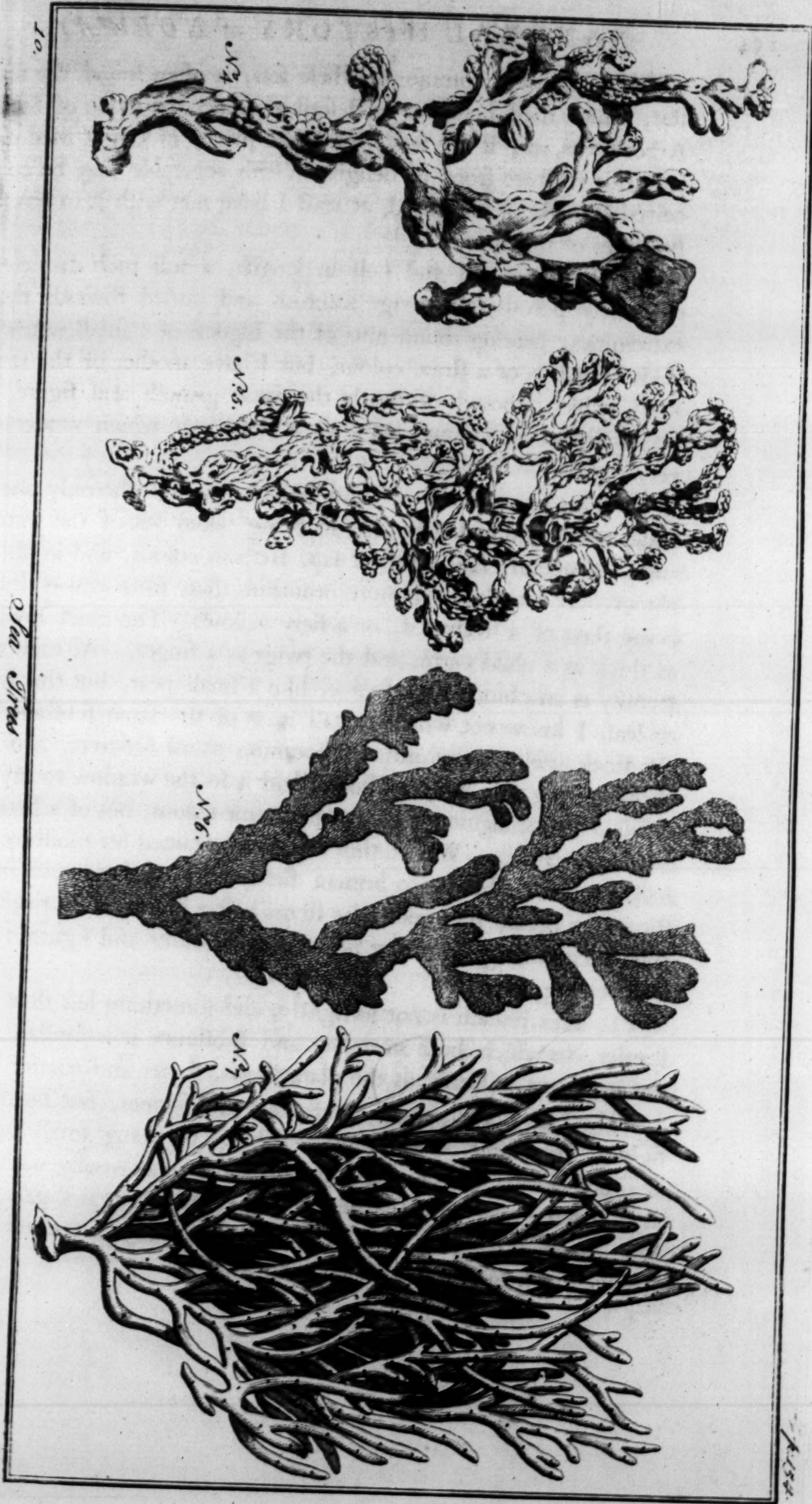
IV. This is an ell and half in length, a full inch diameter, extremely porous, the twigs scabrous and curled towards their extremities; bearing round nuts of the bigness of a small nutmeg. This branch is of a straw colour, but I have another of the same kind, which, though of nearly the same growth and figure, is very different in colour, being of a deep red, which renders it very fightly.

V. This piece is two ells and half long; and the only one I could obtain immediately after its being taken out of the water; and consequently saw it full of sap, fresh in colour, and in all its vigour. It was then far more beautiful than since it was dried, being then of a lively red, or a fiery yellow. The chief limb is as thick as a child's arm, and the twigs as a finger. At each extremity is an oblong excrescence, like a small pear, but this fruit or leaf, I know not which to call it, is of the same substance as the stock itself, a circumstance common to all sea-trees, none of them bearing thin leaves. Having laid it in the window to dry, it distilled a mucilaginous liquor of the same colour, but of a strange unpleasant smell. Whilst this vegetable retained its moisture, it had some resemblance to human flesh, with some minute interstices like pores, but upon the stems being dried and shrivelled, they became larger, so that now both in colour and figure it resembles ginger.

VI. This branch is not so fightly, and something less than the former, to which both in colour and substance it is similar, but not in figure, it being, as the plate shews, flatter and coarser.

VII. This branch again is less than the former, but far more fightly, consisting of a bushy assemblage of many small twigs. It is not thicker than a quill, spongy within and woolly without, as if covered over with the finest cloth. Its colour is a pale yellow: It has a flat root, preserved better than any of the rest, by which, this species is connected with the rock.

VIII.



Handl.

Handl.

No. 1

No. 1

No. 2

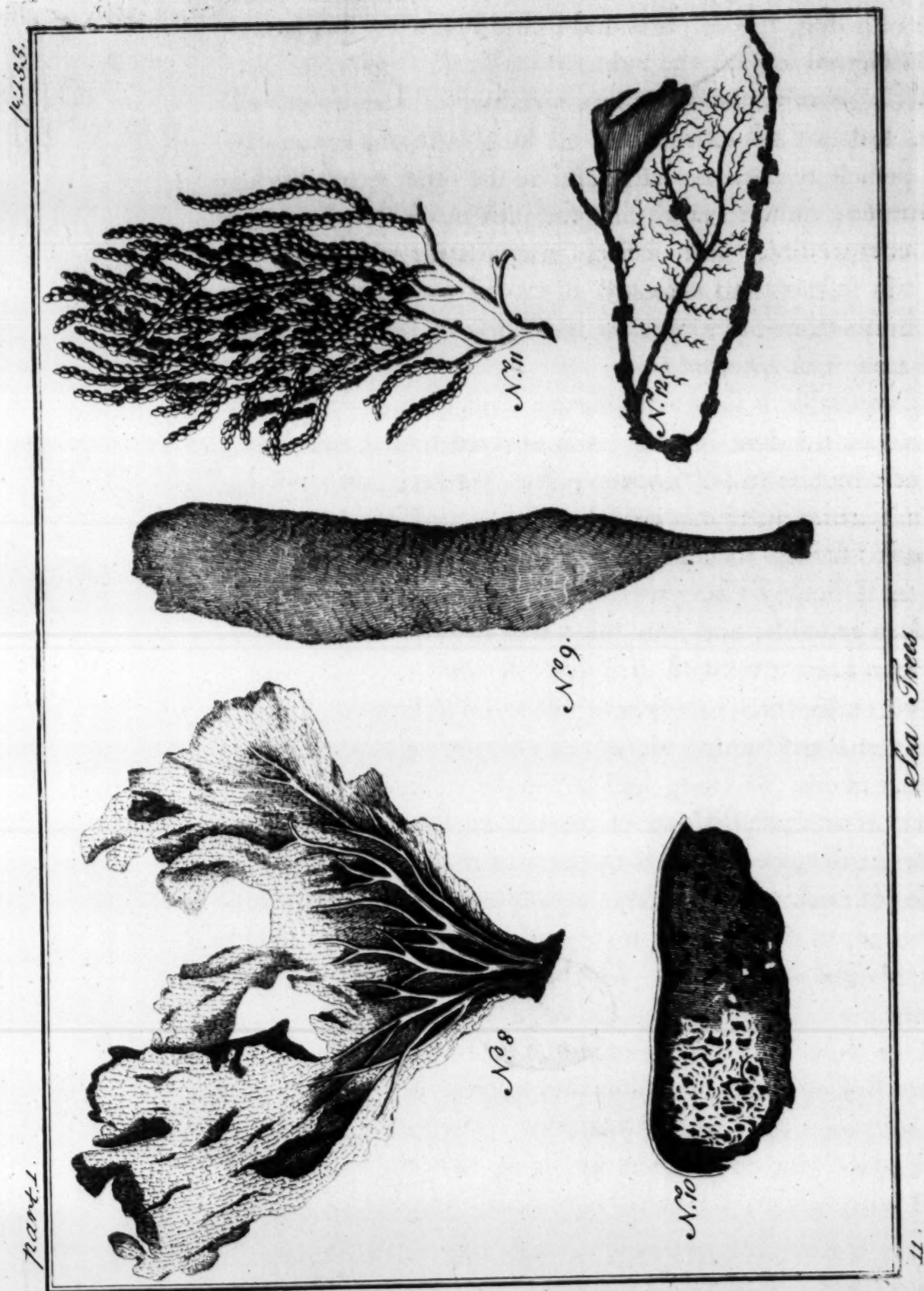
No. 3

No. 4

San Giovanni







VIII. This is of the same colour, and but very little larger, as Plate XIII. likewise of the same soft woolly substance, but without any twigs, and consists in one flat thin and extended piece, not unlike the ear of a dog, full of pores and subtle branches, like green leaves when viewed against the light.

IX. This is an orbicular fungous vegetable, of the colour of the former, but not a quarter of an ell long. At one extremity is a round pedicle two inches long, and at the other extremity an aperture, running quite through like the pith in elder. This vegetable is compressible, but elastic, immediately recovering its roundness; in softness and delicacy, it exceeds any which I have seen, and unquestionably might be made use of by surgeons, if they could have it at pleasure*.

X. This vegetable is somewhat harder, but smooth and fungous. Its colour is a dark brown; it is covered with a thin bark, the inside of which is full of imperceptible, yet very sharp points, of a vitreous nature, so that it may be used in polishing, but not with the naked hand; these points easily penetrating into the skin, and being as difficult to be got out. This grows, like the mushroom, in deep grounds, and sometimes weighs thirty-two pounds. The fishermen draw it up with their lines or nets.

XI. A vegetable three half-quarters of an ell in length, in figure not unlike the *Ligustrum*, covered all over with multitudes of small angular nodes, so close, and at the same time so slenderly joined, that on the least shaking of the branch some of them fall off. These small nodes, which to the naked eye appear like so many grains of buck-wheat, make a very splendid appearance thro' the microscope, as if they were silver and gold laminæ, or shields curiously embossed with figures. The branch itself is round, black, and smooth.

XII. This is a very tender incurvated branch, whose shoots likewise are full of glittering points and angles, but its extremity perfectly resembles the *Conchæ anatifera*, of which I shall speak in another place, the only difference being that the muscle-shell is invested with a thin brownish tegument, and but of half the

* Concerning these spongy marine substances, some relate that they have a kind of Systole, and Diastole, are that in its most subtle parts these are discernible long after its being taken out of the sea, till the total evaporation of all its moisture.

bigness of these; tho', in time, it might have equalled it; three other long, but smaller muscles, doubtless of the same kind, but thin and soft as a herring-scale, hanging on the side of this branch.

Voyage aux
Iles de l'A-
merique,
Tom. II. p.
557.

Sea-bean.

Concerning the quickness or slowness of the growth of these several vegetables, nothing can be advanced very positively; but of a certain sort used in the West-Indes for burning lime, father Labat relates, that he observed the branches to grow four or five foot in two years, tho' never above the surface of the water, yet growing there upon much higher grounds than hath fallen within our observation here. The branches on reaching the surface of the water, spreading themselves as it were to avoid the air, for which their porous bodies are not adapted. If it be asked, whether these sea-trees bear any thing, which may properly be called a fruit or seed, though nothing like it has occurred to me or any of my correspondents, yet along our sea-coasts one meets sometimes with substances which favour the affirmative. Among these I particularly reckon one, to which I shall take the liberty of giving the appellation of *Faba-marina*, a sea-bean. It is of the size of a chestnut, orbicular, yet flat, or as it were compressed on both sides. Its colour is a dark brown yet in the middle, at the junction of the shells, it is variegated with a circle of a shining-black, and close by that another of a lively red, which have a very pretty effect. The inside of the shell is entirely black, but the kernel is of a pale yellow, and in taste, when dried, not unlike a French-bean, so that could they be had in great quantities, a very good use might be made of them. Mr. Frederic Arentz, superintendent in Syndfiord, who lately sent me a sample of them, says, that they were found among the Tang, and other sea-weeds, which had been thrown up, and driven ashore by the wind and waves, from whence they might be concluded to belong to the sea, unless they are to pass for an Indian vegetable of the tribe called *Pediculus Elephantinus*, which, by the loss of some ship, was, in the course of time, brought to this coast. But having received some of these beans from another virtuoso, who lives some miles from hence, the arrival of them on this coast, is more usual, than agrees with any such opinion. As to bringing this vegetable from the opposite coasts of America, whence wood and the like are known to be
driven

driven towards Iceland, this is so long a voyage, that the beans would infallibly putrify, or at least be damaged before their arrival, which however is not the case, the taste being, as is already observed, exactly that of the French-bean, without the least mixture of the saline property. An account of this exceeds my comprehension, but it is so with the sea-trees themselves, or with their shoots and buds, which may be looked upon as their leaves. They are quite insipid, tho', till dried, not without smell. Concerning these sea-beans, I shall further add, that the famous Hap-^{In Mundo Mural. T. 1. Lib. iii. cap. 6.} pelius mentions some marine berries without taste, growing on those weeds, which the Spaniards call Sargasso, and the Dutch, sea-parley, with which the sea near Cape Verde is overgrown for several miles.

S E C T. IV.

From the description of the above marine vegetables, or trees, especially the pieces four, five, and six, they may be premature corals, the consequence of their inward and outward parts being such, that the principal or only difference lies in the want of hardness. If I could be convinced that the corals are not originally hard, but gradually become so, by a kind of petrefaction, I also should subscribe to that conjecture, but what suspends my assent is *, that among the northern corals, some plants, which from their smallness may be judged to be young, yet in their first vegetation seem of a compleat hardness. This is confirmed by Pelschoor,^{Northern corals. Tyrocin. chyrionic. Lib. ii. cap. x. p. 153.} who says, "That the divers, who have been among the coral bushes under water, found none soft, but of the like hardness as afterwards." Thus it is not the air which indurates them as O. Wormius imagines: *Soliditatem demum debitam, ab aëre ambiente acquirit.* This from the two following verses, appears to^{In Mus. p. 231.} have been also the opinion in the times of Ovid.

*Sic et corallium, quô primùm contingit auras,
Tempore durescit: mollis fuit herba sub undis.*

Metam. Lib. xv.

* Sir Thomas Brown in his *Pseudodoxia, or Enquiries into Vulgar Errors*, Lib. II. cap. v. p. 72, where he justly rejects the opinion of corals hardening after being brought into the air, yet believes that the saline petrific spirit in the water, does not at the same time operate universally on all the parts of a plant. All coral is not hard, and in many concreted plants, some parts remain unpetrified as wood.

Among

Among the Greeks they were not improperly called λιθοδένδρα, i. e. stone-trees, stone in substance, and trees in growth and figure. Among the branches of the several northern vegetables in my possession, hang several soft filaments, about three inches in length, and the bigness of a straw; these I look upon to be other marine plants different from the coral, tho' their colour, like that of the coral, is of a pure white. I have also perceived a brown oil or sap to distil from the orifices of a coral capsula; which, as far as it reached, made a visible alteration in the whiteness of the coral. I shall now exhibit a concise view of my collection of northern coral-plants, which were halled up in the fishing-nets, both here and in Sundmoer.

Description
of several co-
rals.

1. A piece half an ell in length, and a quarter and half in breadth, its shoots open and expanded, with pretty large flowers, or stones; its colour perfectly white.

2. A thick piece almost round, with its twigs intermingled like a thorn, the stones small and black, all the other parts yellowish.

See plate xiv.
fig. A.

3. This is a quarter and half long, and a quarter of an ell in breadth, implicated almost like the former, but flatter; entirely white, the flowers much larger than the former, some of them even exceeding a shilling; and likewise expanded like a flower in full bloom, for which singular beauty I caused a draught of it to be taken.

4. A piece of considerable thickness, the main shoot much stronger than the former, with a large and globular node, like the capsula of a flower before its bloom; but the other twig has open stellated flowers, with a cavity larger than the former.

Fig. B.

5. A small elegant coral shrub, with flat shoots, being an exact representation of the extremities of a stag or rein-deer's antlers, adhering to a stone.

Fig. C.

6. Another of the same kind, likewise growing from a stone, of a greyish colour, as is the former.

Fig. D.

7. This is very slender, being a plant just beginning to open the stone.

Fig. E.

8. The like, but more expanded.

Fig. F.

9. This is no bigger than the tip of the finger, but formed in a manner, the like of which I have never seen. It somewhat re-





seembles a small funnel, and its sides form a beautiful web like the finest filigrin work, of a straw-colour.

10. Of the same colour as the former, flat, with several pretty ^{Fig. G.} indented shoots, about a finger in length, and half as broad, but appears to have been much larger before it was detached from the body of the plant; which, when entire, must make a very beautiful appearance.

In Nordland are sometimes found coral plants or shoots, of ^{Some other kinds.} which one side is red and the other white, but, having never seen any, I cannot warrant the certainty of it; but I have a brown stone of the bigness of two fists, incrustated with coralline substances, the external colour of which is carnation; but within it is of the whiteness of snow; it consists of some hundreds of great and small round bosses or buds close to each other, and forming an agreeable figure. Very probably these would have been bigger had they remained longer in the water. This piece I account a *Madrepora abrotanoides tuberculis horizontaliter positis*, and in a collection of the naturalia of Norway, I have since seen larger and taller plants of this nature.

The fishermen often sell coral bushes to the apothecaries at Bergen, and, upon being asked, what is their opinion about the origin and growth of this marine vegetable, they answer, that sometimes a white drop is observed to fall from the branches of the old coral, as well as from the sea-trees, as if it were milk or seed, and where this falls a vegetable is produced according to its species. This account is in some measure, confirmed by this, that the vegetable, number seven, has under it a white and flat macula like a root, spreading to the extent of the plant. The same likewise is further attested by Tavernier, in his travels to India, where he speaks of the coral-fisheries in the Mediterranean, but he is mistaken, in imagining that not the least sprig of it was to be found in the whole ocean, our northern coasts manifesting the contrary: As to its medical uses it has the character of being absorbent, refrigerative, emollient, astringent, and strengthening, which may be true, when the tincture of it, consisting of the extracted salts or oil, is administered inwardly; but, that the little beads, made of the coral (they not being as some imagine, fruits or little berries growing thereon,) are endued with any such fin-

PART I.

T t

gular

gular virtue that when applied externally, or hung about the neck, they are a preservative against the apoplexy, the plague, and other contagions, I cannot admit, having no evidence of it, but must leave it to rest upon its own credit. It is certain that the dealers in coral at Genoa, and Marfeilles, have a great vent for their commodities in the eastern countries. Tournefort says, that all over the east they wear necklaces and bracelets of coral beads brought from Marfeilles. Possibly could white coral be brought into fashion, a diligent search might procure as great a quantity in our seas*.

CH A P. VII.

Of several kinds of Gems and curious Stones in Norway.

SECT. I. *Of Pebbles.* SECT. II. *Marble of different fineness and colour, Spar, or glittering stones, Alabaster, Chalk-stone, and the like.* SECT. III. *Sand-stone, Mill-stone and Slate.* SECT. IV. *Talk.* SECT. V. *The Magnet.* SECT. VI. *Amiantus, or Asbestos.* SECT. VII. *Pyrites, and Quartz or Marcasite.* SECT. VIII. *Crystal and Isinglass.* SECT. IX. *Granate, Amethyst, Chalcedony.* SECT. X. *Jasper and Agate.* SECT. XI. *Thunderbolts, and other figurated stones.* SECT. XII. *Some stones plainly indicating their substance formerly to have been soft and fluid.*

IN the order I proposed after the vegetables and plants in Norway, follow the several species of stones, with the several metals and minerals resident in them; but in this seventh chapter, I shall confine myself to the former, referring the metals and minerals to the ensuing.

S E C T. I.

Of Pebbles.

It is the less necessary to dwell upon the common pebbles, of which the mountains here and in other parts chiefly consist, they being well known; and I having offered my thoughts concerning them in the second chapter, on the origin, formation, and different figures of the said mountains; but one particular concerning these pebbles must not be omitted; which is, that a certain brown

A perishable
kind of
pebble.

* Concerning the white coral fished for in the lakes of Numidia, and which differs only in colour, Doctor Shaw, in Tom. II. App. p. 124. of his travels, says, that it is scarce, but whether it bears a higher price there, I am not informed.

kind of them decays with age so like old wood, to which, in its incurvated veins and channels it is not unlike, dissolves between ones fingers; drops from the mountains into the sea, and sometimes occasions the afore-mentioned calamity of a disrupcion; so that the traveller round the Norway-coasts, may find sufficient proof to confute those visionaries of all ages, who have imagined the world to be eternal; and these proofs may be drawn a priori: For if the world were eternal, its decline could not be so conspicuous as it is, within the few centuries, which we can compute with certainty. Time, the voracious consumer of all things, exerts its corrosive power every where on the hardest rocks, but more remarkably in certain places; and whoever has lived any time on these coasts must have observed the stones dissolved, and the separation begin in the veins, where the pores and softer substance sooner yield to the daily impressions of the air and sun. In many places the northern grey and black pebbles are intermixed with iron, copper, lead, silver, and even gold; of which we shall treat in the sequel. Great quantities of these pebbles are at present used for building houses, walls, and inclosures, especially in and about Bergen, the neighbouring mountains furnishing them with little labour, nature itself having as it were prepared them by fissures, into which, the wedges being driven, such flat angular pieces fall off, that without being shaped by the chissel, they suit one another so well, as to form a compact wall. In some places, especially at Gloppen in Nordfiord, I have been amazed to see whole mountains consisting of these pebbles naturally divided, and as it were cloven, almost of equal sizes, that is, from two to three cubits each, as if they had been sawed both longitudinally and transversally. These pieces are easily lifted with two hands, and resemble the ruins of an old wall. Mr. Buffon speaks of a mountain of the same nature near Fontainebleau. These northern fragments lie near the creeks, and being easily embarked, might load several thousand ships, the quantity being sufficient to build large cities. How these regular fissures and separations may most rationally be supposed to have happened, soon after the deluge in the originally soft, and afterwards gradually indurated pebbles, I have offered some conjectures in the second chapter, which treats of the soil and mountains in general,

Steenur.

general, where I likewise considered the disruptions or breaks of mountains. When a part of a rocky mountain, being undermined and detached, falls from its vast height, and in its fall happens to strike on a hard ground, and is broke into some hundreds of smaller pieces, this collective body of fragments is called *stenuur*, and the innumerable points and angles of those broken stones render the roads extremely troublesome, tho' sometimes they are observed to lie in such symmetry, that their former cohesion may be judged from their concave and convex sides. In the parish of Houg, three Norway-miles from Bergen, about twenty years ago, a very surprising accident happened to a man, who walking under a mountain, was on a sudden entirely covered with the fall of such a congeries of large stones, which formed a kind of vault around him. Here he remained unhurt for several weeks; his friends, who by his outcries had found the place of his confinement, knew not how to extricate him, the stones being immovably large. They reached him meat, and drink, for some time by means of a pole, thro' the crevices, but at last, the stones fell in and crushed him.

S E C T. II.

Marble of
several kinds.

Marble, which in most countries is so scarce, and bought up at so great a price, is found here in several places, and in such quantities, that if all Europe were to be supplied from hence the quarries would not be exhausted; for several ridges of mountains consist almost wholly, or, however, chiefly of marble, upon breaking the lapidous incrustation, which is a porous substance, and about an ell or two deep, as a tegument to the more precious marble, in comparison with which, it appears to have a kind of foam or froth, interspersed with small orbicular cavities, as the surface of melted wax, or the like after its induration. I have elsewhere confirmed the opinion of the liquefaction of the rocks, as built on other unexceptionable grounds, exclusive of these incrustations. Had the inquisitive Mr. Tournefort reflected better on this truth, and the consequences which may be drawn from it, he would not have been under a necessity of assenting to the strange position of the vegetation of marble, to account for some shoots and excrescences of marble found in a cave on the island of Antiparos,

some

some depending from the roof of a cave, others shooting out of the ground like trees or plants, which he actually represents them to be. His words are, *Il semble, que le nature nous avoit voulu montrer par-la comment elle s'y prend pour la vegetation des pierres, il semble, que ces troncs de marbre vegetent, car outre qu'il ne tombe pas une seule goutte d'eau dans ce lieu, il n'est pas concevable, que des gouttes tombant de 23 ou 30 brasses de haut aient pu former des pieces cilindriques terminées en calotte, &c.* So far he is right, that another origin of those figures must be sought here, than these Stalactites, as they are called, or drop-stones, which are frequently found in subterraneous caverns; yet there is no necessity of recurring to the vegetation of marble; a third cause offering itself, that these long shoots and drops are unquestionably an immediate work of nature, and may, or rather must have been produced at one time, and if they must be called vegetables, they may have sprung up in a night, like mushrooms, or perhaps, in an hour, or even a minute; and that during or immediately after the deluge, when the detached or liquefied stony substances began again to settle and consolidate. In that case, it is not in the least improbable, that some of the softest part of the marble, consolidating last, should meet with a resistance from these parts of the marble, which had already subsided, and run into these shoots, clusters, and other figures, in which they appear at present. This is most evident in marble and other hard stones, not only from other indications, for they manifestly contain solidum intra solidum; but particularly from the beautiful blendings of their colours, and spots, veins and streaks, like a dried mixture of oil colours, which, when cut through, shew the like intermingled streaks, as in our marble quarries. I myself am possessed of such a piece of artificial marble, though I confess it is much dearer, and deficient in solidity, which only it can obtain in the laboratory of the supreme master of nature *.

* Possibly the ancients had the art of giving it its proper hardness, as must have been the case, if we suppose those vast columns and obelisks of Egyptian marble forty eight ells in height not brought to Rome in one entire piece, which appears difficult if not impossible, but to have been such an artificial granate. Dr. Shaw, in his travels to the Levant, T. II. Ch. IV. p. 81, 82, says, some have imagined Pompey's column and the obelisks of Rome, and Alexandria, to be an artificial composition of cement and sands, cast in a mould.

Most of the Norway marble-mountains are still unknown as such, and will in great measure continue to be of no advantage, except those which are contiguous to the sea or the creeks, for the ready shipping of the marble. I omit the mention of those marble-mountains which I have observed in my journies, particularly at Lillemios in Walders, and elsewhere, much less shall I take upon me to give an account of the new marble-quarries undertaken at the charge of colonel Eigtveds, architect to his majesty, and other proprietors, not far from Drammen, in the diocese of Aggerhuus. But, instead of these, I shall take notice of those marble-quarries in the diocese of Bergen, which have been broke up within this century, chiefly by the family of Lilienschiold, and partly carried on by others, of the produce of which the palace of Christiansberg at Copenhagen is an illustrious instance. Some thousands cubic feet of northern marble, have already been exported for that edifice, especially from Musterhaven, and continue still to be carried thither, besides the demands from England, Holland, Germany, and the countries on the Baltic, and even from Sweden itself, which is in no want of good marble, tho' the Norway is esteemed better, notwithstanding its extreme hardness renders it very difficult to be wrought; and tho' it cannot, as some pretend, to vie in whiteness with that of Carrara in Italy, or in fineness with that of Sicily and Egypt. The chief marble-quarries hitherto opened in this diocese, and their several kinds, are as follows:

Account of
the principal
marble.

1. Hopeholm, not far from Bergen, produces marble of a good white, likewise blue and white, also a greenish kind, with red streaks.

2. Wikenefs in Storoe, six Norway-miles south of Bergen. The marble of this quarry is red and white, very fine and solid, but very difficult to be hewn into squares; likewise white intermixed with green with sulphur-coloured veins, a kind of grey and white jasper; green, with red streaks of agate; lastly, black and white; all very difficult to the workman.

3. Musterhaven, seven Norway-miles south of Bergen, not far from the noted high mountain Siggen. This quarry yields blue marble with white streaks, dark blue with the like variegation,
green

green with greyish veins, likewise an azure marble. This is easier to the chissel than in most places*.

4. Salthellen, four Norway-miles from Bergen, affords a white marble, and easily wrought, but is not so firm as that of Hopeholm, and breaks into longish blocks; it also affords a grey and white, likewise a dark grey streaked with white.

5. Hillebrud, seven Norway-miles from Bergen, the marble of this quarry is white, with a yellowish tinge; it likewise produces a light-blue and white, both kinds very compleat, and in large blocks.

6. Stourfoen-quarry, one of our miles from the monastery of Halsnoe, yields black-marble studded with white spots, and its blocks are large and compact.

7. Selloe, on the other side of this monastery, produces blue and white marble, in larger blocks than are to be met with any where.

To this tribe of stones belongs likewise the touch-stone, *Lapislydius*, being a kind of black-marble; also alabafter, which I have met with in my journey to Sundmoer, near Borgenfund, but of a greyish cast, and only in small pieces, lying as an infused adventitious matter betwixt the strata of hard pebbles; by the peasants it is called *Hejetel*, under which name I have already spoke of it in the 2d chapter, concerning the origin of mountains. Under this species may also be comprehended the several kinds of spar, or other shining stones, like what is called *Katzenfilber*, which are easily reducible to a white powder, as are the chalk-stone, cement-stone, and stucco-stone, to which use likewise the strictures of marble, which fly off in the quarries are applied.

S E C T. III.

Sandstone is found in several places, of a clear and dark grey, yellow and brown, of a fine and coarse grain, and is used either for building or for grind-stones, which last are in greatest perfection at Hædemark; but on account of the situation, the exportation of them is difficult, tho' considerable quantities are brought

* I was lately presented with a piece from this quarry, in which red, green, and white veins were intermixed, in a more beautiful manner than any I had ever seen; the only defect is the softness of the green veins, which hinders a perfect polish.

to Skeen, and from thence carried abroad. The parish of Odde in Hardanger, affords as fine and firm sand-stones as ever I saw, but not in any great quantities. I have been lately informed, that in the parish of Nordal in Sundmoer, there are large mountains entirely consisting of yellow and red sand-stones.

Mill-stone.

Mill-stone, which indeed is but another sort of sand, consisting of grosser substances, but the texture thereof is both more compact and smooth; is exported from Guldbrandsdale, Syndford, and other places.

Baking-stone.

Hardanger likewise affords the best Bagsteheller, i. e. Baking-stone, a flat thin and smooth stone, which being rounded, bread is baked on them, which is likewise done on iron plates. These flat and thin stones likewise begin to be used for covering houses and churches, as slate is in other places.

Slate.

This in some parts is found in such prodigious plenty, that not only the whole ground on which the city of Christiania stands, but the adjacent country is little else than slate, *Collæa lapis fissilis*, splitting into laminæ, or consisting of a succession of laminous strata. But hereabouts the pieces are so small, as not to be applicable to any particular use; nor have coals been found under it either here or elsewhere, as was supposed; from the similarity of the substances, and the black loam intermixed with it being somewhat like coal, besides the circumstance of its splitting in the same manner as coal.

S E C T. IV.

Veeg-steen (soft or Talc-stone) both light and brown, and the finest sorts of it otherwise called Talkstein, Grytstein, and by some Blodgryte and Cloverstein, being very soft and easy to be cut, hewn, or sawed, are to be found almost throughout this and all other provinces of Norway, but not every where in such large pieces as at Stavenger, and the lordship of Sunderhord, from whence some shiploads were lately carried for the palace at Copenhagen*, and the late famous and stately cathedral of Dront-

* The Talkstein is sometimes found in and along with the hardest pebble-stone. Near Malmanger is a deep cavern in a mountain, now almost exhausted, but formerly full of it. This corroborates what I have before said, *De solido intra solidum*, and shews the probability that all lapidous masses were formerly soft and intermixed.

heim was said to be built of this stone, as I have here found several churches, and other buildings of the same. This stone does not consist of sand or loomy particles, but of a fine slimy compact substance, which may be pulverized, when it shines like soap or tallow, but in the air becomes porous, and loses its gloss, as I have observed on the outsides of old churches, which, by length of time, looks as if they had been built of pumice-stone; this stone however is almost imperishable, even in fire, and on that account is by some used for hearths, ovens, and beacons. In Gulbrandsdale, cups, pans, pots and kettles, to the bigness of half a tun are made of it, as vessels of this kind not only retain the heat, but according to Bromel, give a better taste to what is boiled therein, than utensils of any other substance. Of the dark green Talc, which is likewise used for casting variety of figures; I have seen images, and other kinds of sculpture, with as fine a polish, and in every respect as finely, as if of marble or serpentine, yet the latter would have taken up thrice the labour and time; for the Talc-stone, especially of a good kind, is worked much easier than wood itself. Near Stavenger, is found a kind of Talc-stone, of such a whiteness, that it is begun to be used there for powder, as it may be pulverized to an impalpable fineness; and I am inclined to think it would succeed better in painting than ceruse. I also recollect to have read, if I mistake not, in Tavernier, that the principal persons in Armenia, make use of a white shining Talc-stone for painting, and as it were laquering their best apartments, and this Talc seems to be of the kind in question. Of the powder of Talc-stone, which is like to the finest soap, and Talc-oil, an ointment is made for rendering the skin close and smooth. The Museum Wolmianum mentions a kind of Norway Talc, with gold veins, but this must be extremely scarce.

In Litographia sua Caena, p. 26.

S E C T. V.

In the iron-mines near Kongsberg and Skeen, and likewise in some other places, is found that wonderful substance called the magnet, or loadstone, and in such quantities, that some tuns of it are exported, especially to Amsterdam. Ol. Worm, bestows on the northern loadstone, the epithet of *Viribus insignem*, what

The magnet, or loadstone.

PART I.

X x

might

might further be said on it does not belong to this place; I therefore proceed to insert what little I know of the *lapis suillus*, or swine's stone, a production peculiar to Norway and Sweden. It derives its name from its efficacy in the *orafiuke*, a distemper incident to swine; it is also with as good reason by some called *lapis fætidus*, as when rubbed against any substance, it emits a nauseous smell. The nature and texture of its parts is vitrious, nearly like the crystal; it likewise shines, but is brown, with a large mixture of sulphur, which may be the cause of its fætid smell. In an island in Great Mios upon Hedemark, are whole mountains of this stone, which when galloped upon by shod horses emit a violent stench.

S E C T. VI.

Amianthus,
or *asbestos*.

That the amianthus or asbestos, which makes an incumbustible linnen or paper, is to be found in the parish of Waldens, I can affirm from my own experience on this occasion; I had sent for some samples of that wood, which was said to be petrified by a certain water before-mentioned: Accordingly a large parcel of it was sent to me, and at first I could have compared it only to hazle, which had lain a long time in the water, but upon a narrower inspection, and drawing out some of the filaments, I found it was no petrified substance, but an amianthus, and far finer than the Greenland stone-flax, which the Rev. Mr. Egede, in his account of his mission, relates to be there used as wicks in the lamps, without being in the least wasted whilst supplied with oil or fat: This Sundmoer amianthus which is produced in a mountain in Birkdalswamp, deserves like that of Siberia, and even better, to be called stone-filk, rather than stone-flax, its fibres being both softer and finer; I also made a wick for a lamp of it, and it was not consumed, but its light being much dimmer than that of cotton, I laid it aside. I have also in my possession a piece of paper of this asbestos, which when thrown into a fierce fire is not in the least wasted, excepting only that what was written on it totally disappears. The manner of preparing this stone-filk, or stone-flax is briefly this; the stone after being softened in water, is beaten with a moderate force, till the fibres, or long threads separate from each other, afterwards they are carefully, and repeatedly

STANDARD MINUTE WRITER

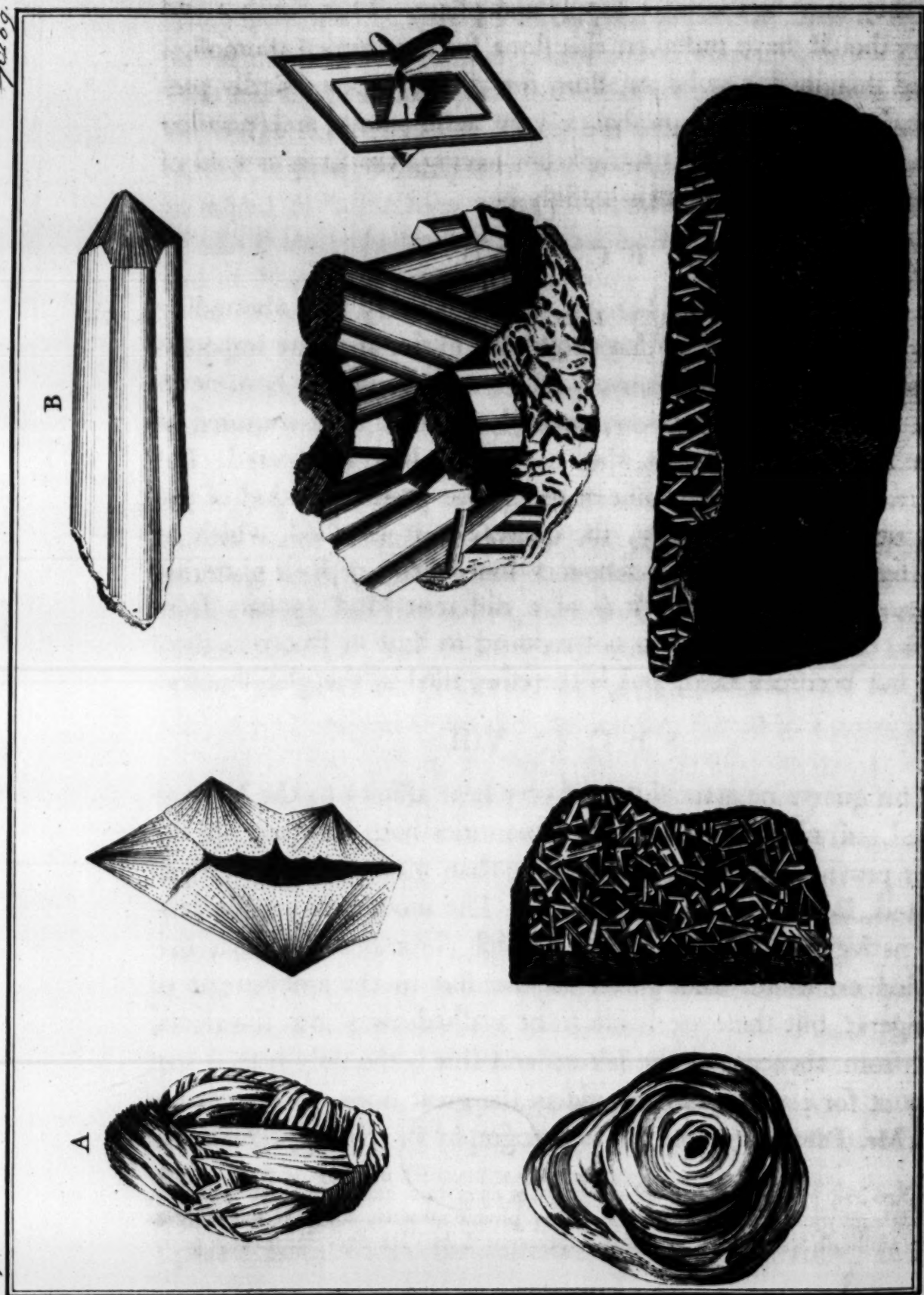
189

January 1st 1890. I have the honor to acknowledge the receipt of your letter of the 29th inst. in relation to the Standard Minute Writer. I am sorry to hear that you are not satisfied with the same. I have been very anxious to make it perfect and I have no doubt that it will be found to be a very valuable and reliable instrument. I have no objection to your returning it to me if you wish. I will be glad to make any alterations or improvements that you may desire. I am, Sir, very respectfully,
Yours,
J. H. B. B. B.

I have the honor to acknowledge the receipt of your letter of the 29th inst. in relation to the Standard Minute Writer. I am sorry to hear that you are not satisfied with the same. I have been very anxious to make it perfect and I have no doubt that it will be found to be a very valuable and reliable instrument. I have no objection to your returning it to me if you wish. I will be glad to make any alterations or improvements that you may desire. I am, Sir, very respectfully,
Yours,
J. H. B. B. B.



Fig. 69.



Stones and Crystals in Norway.

part 1.

peatedly washed till cleared of all terrene particles; then the flax is dried in a sieve that the water may run off the sooner; all that remains now, is to spin these fine filaments, wherein great care is required, besides which, the fingers must be softened with oil, that they may be the more supple and pliant. That Kircher and others should have mistaken this stone for the *alumen plumosum* *, and imagined it to be an *allum* fire-proof, appears hardly probable, especially as *allum* has a very acrimonious and peculiar taste, which this stone is so far from having, that it is as void of taste as any other stone can possibly be.

S E C T. VII.

A physical singularity here, is, that a country thus abounding in stones has no flints, so that those used in fire arms are imported from Denmark, or Germany. In all my circuits, I have never seen a flint-stone in Norway, and all whom I have enquired of agree that if there are any, they never have been discovered: But on the other hand, the mineral mountains produce a kind of pyrites or fire-stone, namely, the quartz, as it is called, which at first sight resembles the before-mentioned spar, or such glittering vitrious stones; but that it is of a different kind appears from hence, that in the fire it is not reduced to lime or stucco as those are; but becomes fluid, and is therefore used in the glass-houses.

S E C T. VIII.

This quartz or marcasia, is of very near affinity to the Norway crystal, of which there are great quantities both here and in the other provinces, and of a larger size than most of those in Switzerland, Bohemia, and other parts. The mountains are the proper native place of the crystals, which sometimes are seen suspended on them, and glitter in the sun to the amazement of strangers; but these are liable to be washed away into the rivers, and from thence into the lakes; and this is the only way I can account for crystal being found in the great mios, as it certainly is. Mr. Peter Underlin in his topography of Norway, mentions

* Dico itaque hunc lapidem esse compositum ex certa aluminis seu talci specie, ut proinde eum multi *alumen scissile* aut *alumen plumæ* nominandum putarint, est enim multo mollioribus filamentis etc. *Mund. subterr. Lib. VIII. Sect. III. cap. 1. p. 67.*

his having a piece of crystal as a very extraordinary curiosity, of four ounces weight taken from thence, but this is trifling in comparison with a piece found in Hardanger, and now in my hands, which is within an ounce of five pounds in weight, twelve inches in length, and seven in thickness, and I never saw so large a frustum of the angular and conical kind, tho' it must have been larger, with little projections from its sides, which the former owner confesses he broke off for presents, so that now there remain only four uniform angles; but two of them have since had the fate of the former. I have several smaller pieces of an hexagon figure, with the extremity terminating in a point*; these regular, sexangular, and conical crystals are by our peasants called *duergnagler*, dwarfs-nails, from an old notion, that these were nails which the dwarfs, who, they imagine, formerly dwelt in the mountains, threw away as quite unnecessary to them, as being without heads. But the general name for the crystals here are *biergdraaber*, mountain-drops, which name corresponds with the accounts of the naturalists of the origin of crystals, and happily expresses that sort which hang on the mountains, in the shape of grapes, or other indeterminate figures. On the other hand, I know from experience, the afore-mention'd long and regular pieces, which are all sexangular, are generated in a chalky porous stone, in shape like a drop-stone, having a piece of it which was found in a mountain, near the parish of Forde in this province of Sundfiord; this is a little larger than a hand, though twice as thick, but filled both longitudinally and transversally with these minute prismatic crystals, hundreds of them projecting, as if drawn through with a larding-pin; so that I place a great value

* How this moisture of the quartz, or marcasia, dropping from the mountains becomes indurated, and in time produces a vitrification or crystallization, is in some measure illustrated by J. Fr. Henken, in his *pyrotology*, chapter 5. page 354. and likewise the cause of its hexagon figure, in the manner of the saline rays, *ibid.* p. 362. Likewise Kircher, in *Mundo subterr.* Lib. VIII. Sect. 1. p. 25. *Act. Societ. Hafn.* Tom. III. p. 281. Leibnitz *Protog.* Sect. XXVIII. p. 44. Within these mountain-drops, is sometimes inclosed another heterogeneous substance shining like silver, and by the ignorant thought to be so. I have some such pieces, which I accounted first rare curiosities, till a more experienced friend of mine shewed me, that upon being rubbed or pulverized their lustre vanished, and the supposed silver turned into a terrene sediment. *Argenti flores appellant fodinarum magistri, albas guttulas, quæ crystallis atque mineris insident et quasi sementum essent argenti, apud eorum nonnullos maximam habent estimationem etiam raritatis titulo. Quamvis autem haberi et esse forsân possint inchoamentum argenti, nondum tamen id penitus observationes persuadere voluerunt.* Aloyf. Com. Marfili. Danub. Panon. T. III. page 168.

upon this piece of stone, as a manifest mother of crystal *. Were it not for the yellowish cast, too common in these northern crystals, like those of Bohemia, and Hungary, they might justly deserve the appellation of Norway-diamonds, which Mr. Arent Berendsen confers on them; for the original essence and formation of the diamond, namely, a filtrated, vitrified, dense, indurated mineral juice is likewise that of these crystals, the whole difference being, that the filtration here is less perfect. It appears, however, that as nature in other things sometimes deviates from her general rule, working either more delicately or coarsely than usual, so the northern crystals may be accounted such deviations, from her general rule in the formation of diamonds, or Norway mountain-drops. A certain officer of reputation of the district of Hardanger, a few years ago sent to London two stones found there, in order to have them made into a pair of ear-rings for his lady. When the merchant to whom he had given this commission, called upon the lapidary for them, he was asked what he looked upon those stones to be, the merchant answered, Norway-crystals, then replied the lapidary, give me a note of hand that they shall not be passed for real diamonds, which the merchant very readily did. I mention this little story, partly to shew quantum est in rebus inane, and how, in matters which are highly estimated, and sometimes deserve so to be, the world is more governed by imagination than reality, as otherwise there could not be at least that

* *CrySTALLUS montana* (prout ex pluribus observationibus feliciter didicimus) non est aliud quam ramificatio seu propagatio durissimi filicis, quartz, lactei sæpius coloris ac opaci, cujus dorsum si compluribus compressum stratis, interius tamen aliquid vacui fortiat, intra quod libere valeat in ramulos propagari, tunc generatur crySTALLUS (non vero ex aqua gelu in montibus vehementiore concreta, (ut Plinius, Seneca alique non pauci tradiderunt.) Quod si cinnabris effluvia ipsius sese commisceant vegetationi (quod nobis plerumque videre contigit in argentifodinis) tunc eidem amethysti colorem non tam rarò impertiunt. Et rem sane verosimiliter sic se habere, per Helveticas Alpes ad montem S. Gotthardi, anno 1682, iter facientes amplius intelleximus ac edocti sumus ibi à fossoribus crystallos eruentibus. Hi siquidem in pluribus nobis monstrarunt ventriculum seu cavitatem quandam, cujus parietibus majori ex parte substernebatur filix seu quartz, intra illam cavitatem vegetans, cujus puriores ac tenuiores partes filtratione quadam à reliquis segregatæ ac sensim concrecentes assurgebant seu distendebantur in conos crystallosum angulares, Aloys. Com. Marsili Danub. Pannon. Tom. III. p. 89. This is further worth observing, that as the effluvia of cinnabar veins in the mountains, by the tinge, which they communicate to crystals, make amethysts of them, the turquoise and emerald in the like manner owe their colours to vitriol. P. I. page 100. The absurdity of that opinion of Pliny, Seneca, and other ancient naturalists of the formation of crystal like ice, by an intense frost, has been more than sufficiently exposed by Sir Tho. Brown in his vulgar errors, Lib. II. cap. 1. p. 37.

immense disparity in the price of our native and the Oriental stones. I have among my small collection of Norway-crystals, a piece so clear and pure, and withal not vitrious, that in the judgment of the connoisseurs, it might be cut into a very exquisite jewel*.

Marienglas.
Ifinglas.

Among the Norway-crystals is also reckoned the Marienglas, Ifinglas, or Rysglas, as it is called here, being mostly found in Russia, where, on account of its transparency, it is used for window-panes. This is a particular species of stone lying in strata, or flakes, or like so many sheets of paper, and as easily separated. I have a piece of dark red, which is very uncommon, it being generally clear or greyish. Wormius, who had never seen any of this colour, page 56 of his *Musæum*, says, that this Russian-glass is sometimes found in marble, and sometimes in hexagon figures, like the above-mentioned mountain-crystals.

S E C T. IX.

Granates.

Granates, which derive their name from the similitude of their dark red colour, with that of the kernels of the pomegranets, are found at Kongberg, in Gulbrandsdale, Osterdale*, and other parts, and not seldom inclosed in other masses of stone; and Mr. Bromel says, that in Norway, as Jempteland, many mill-stones are mixed with granates, but the few in my possession, or which I see elsewhere, and are of the size of a middling hazle-nut, with many angles, have no particular lustre, and are foul, or as the phrase is, not ripe. Those mentioned by Olig Jacobeus, among the northern curiosities in the *Museum regium*, I suppose, make a better appearance.

In Litho-
graph. Succ.
P. 45.

Page 34.

Amethists.

Norway amethists are likewise mentioned there, but with the addition that they want the hardness of the Oriental. The same author, page 32, likewise mentions another stone, which he thus describes, *Pyrites aureus tessellatus, maculis purpureis ac hyacinthinis hinc inde distinctis ex osterdalia Norvægiæ*.

* Crystallos puriores Americanis suppeditat Norvegia nostra, ut ex specimine transmissio videbis. Ep. Ol. Wormii, Tom. II. p. 820.

† Reperiuntur etiam Norvegia dodecalatorum impuriore, vena talci plerumque infecti, colore ad nigredinem tendentes, ut eò primum genus Orientalium æmulari videantur, natura quandoque polita. Tantæ magnitudinis mihi unus est, ut ovum columbinum superet. Crescunt in vena talci tanta copia, ut ex iis cum vena sua junctis, lapides molares conficiant. Ol. Worm. Mus. p. 104.

The

The Ferro-islands afford plenty of Chalcedonies, but which are ^{Chalcedony.} not above twice the bigness of a pea, very seldom reaching that of a hazel-nut, of which size I have some in my collection. The Museum Wormianum, page 98, mentions two of an oblong figure, and of the bigness of a man's thumb, and he also speaks in the following manner of those of Iceland: "Chalcedonium islandicum cristalloidem voco lapidem. Massa est unciarum duarum longitudine, totidem latitudine, qua latior est. Parte qua cauli adhæsit, saxo constat albo, duro, cui nigredinis quidpiam permixtum, ex quo efflorescit crusta quædam calcedonica, crassitie calami scriptorii. Hæc vero ex se papillaceas quasdam strias protrudit ejusdem substantiæ, externa superficie asperas instar sacchari candidi, granulis minutis micantes. Parte anteriore tres sunt papillæ, quarum media reliquis longior, una reliquis minor, versus latiore partem una duplicata. Omnes hæ papillæ, ut et corporis ipsius tota superficies superior quasi conglaciata est, splendentibus granulis crystallinis aspera. Elegans certe est, a nemine, quod sciam, descripta." Of these glittering and angular little grains, which are said to adhere to the island Chalcedonies, there are frequently found deep in the earth many white muscle-shells, quite full; an indisputable effect of the deluge; these bodies, when liquid, having insinuated themselves into these shells, where they afterwards became indurated; and I myself have some of this kind in my museum.

S E C T. X.

Agate of several kinds are produced here, and I have some ^{Agate,} pieces of red and yellowish, which were found in Sundmoer, and the same abound in other places. The ground near the parsonage of Findaas, is said to be full of large veins of agate; but generally so hard as not to be wrought in any other manner than by grinding. Baron Holberg, in his Present State of Denmark and Norway, says the like of a kind of hard but beautiful jasper, found in a mountain two Norway miles N. W. of the parsonage of Sillejord, of which governor Wibell, in the year 1726, had a set of tea-cups made, for a present to his majesty Frederic IV.

Among several small pieces of green jasper, found in the Ferro-islands, Ol. Wormius mentions the following: "Quedam Turco-^{In Mus. p. 94.} ides, æmulantur, quædam Malachites, quædam in matricibus suis exist-

existentes jucundum dispicientibus præbent spectaculum—Inter jaspides ex insulis Ferroënsibus allatas, reperiuntur etiam jasponiches numero haud exiguo, videtur enim natura in istis insulis intenta esse, ut onichen viridi colore tingat, verum opus suum ubi impedita non absolvit remanet jasponix, quin et jaspidis capnitis hic visuntur specimina.

S E C T. XI.

Figured
stones.

Of figured stones I have several, some of which were found in Norway, but shall not enlarge on these, as not being peculiar to the country; yet, I cannot suppress the observations of a judicious person on some small circular, and flat stones, perfectly smooth, and of a mixed substance, dark brown, yellow, and grey roundish specks being blended among one another; but they are sometimes found as big as a hen's egg, and by the peasants called lospesteen, loosening-stones, from their opinion, that they are beneficial to women in hard labours. They also pretend, that this stone is the supposed thunderbolt, it being found where the lightning has penetrated, and as it were plowed up a furrow on the mountains. I leave this without any comment, yet I beg leave to insert the words of the above-mentioned person, Mr. Fred. Arndtz, superintendant at Sundfiord, and minister at Itskevold, in a letter to me, of the 22d of September, 1750.

“ My Lord, I take the liberty to send you in the box which comes along with this, a small stone lately come into my hands, and of which, I own the curiosity to consist only in the account which the peasants have given me of it. They say, that the thunder darts down such stones, aiming them at the Troll (a kind of witches, or infernal spirits of the night) who otherwise would destroy the whole world, and it makes use of these stones for bullets. The reason on which they attribute these stones to the thunder, is, that they are commonly found in those places, where the earth has been torn up by a violent thunder-clap; the usual size of this stone is like that before you, though the largest, both in figure and dimensions, entirely resemble a hen's egg. That the thunder tears up the earth into a kind of long furrows is very certain. I have seen it myself here in Sundfiord, and in such furrows these stones are found: this the people affirm very positively, offering several in-

stances in proof of it. I am aware, that all that is said of these thunder-stones, is by many looked upon as mere fables, and I myself cannot entirely come into many of these traditions; as that in a violent tempest, these stones have struck against a ship's sail and dropped down upon the deck, or that a woman who was at work at her quilting-frame, when the whole house was suddenly destroyed by a clap of thunder, but she not in the least hurt, found such a small stone lying on her frame. However some maintain the truth of these things, and have not the courage to refuse historical credit to accounts of this nature, and indeed they are not entirely destitute of all verisimilitude, if the production of the stone be considered, its primordial element being a slimy water, mixed with matter and inspissated by fire, whence a petrifying juice. The stucco works are supposed to afford a specimen of such a mixture, which are somewhat hardened by the infusion of a small quantity of water, but by the infusion of oil acquire the solidity of stone. That such a *materia lenta et viscosa* may ascend into the air is undeniable; that the lightening may have very wonderful effects in the atmosphere must also be granted, and that a solid compressed body by its own gravity descends is natural. But there seems, notwithstanding, less difficulty to comprehend the thunder-stones formation in the earth for the wonderful force of thunder, of which there are so many incontestible evidences, and of which I myself have seen some in the bayliff's house at Turre, should easily induce us to subscribe to the following words of a learned man, *Radios fulminares terram penetrantes, arenam, quam forte offendunt, in talem aliquam massam lapideam per vitrificationem quandam colligere.* I suspend my judgment herein, and only add, agreeably to my design, that this stone is by the peasants called *laafnesteine*, i. e. loosening-stone, from the effects attributed to it; for the women, and especially the old nurses, imagine this stone to be something exceeding sacred; and it is with great difficulty they can be brought so much as to shew it, much less to part with it; from their persuasion, that beer drawn in a cup with this stone in it, being given to a woman in labour, facilitates the delivery; or as the peasants phrase is, *dælaafne*, i. e. the foetus is loosened, *solvitur vinculum rumpitur.*" So far this letter.

Thunder-
stones.

The *ceraunei lapide*, thunderbolts, which were formerly accounted thunder-stones, are now unanimously allowed to be stones artificially wrought into axes, hammers, wedges, and knives, which in the heathenish times were used at such sacrifices, as, according to their superstition, did not admit the use of a tool, or instrument of any other substance; they are found both here and in Denmark, and chiefly on such eminences as were appointed for sacrificing. I have them of different substances, colour, size, and figure. The last has the strongest marks of being the work of art and not a natural form, especially in those which have a circular hole where the handle or grasp was inserted.

Eagle-stone.

Aetites, or the eagle-stone, is found here as in other parts in the nests of eagles, who, probably, lay it there, to moderate the violent heat exhaling from the breast of the dam, the eagle being a bird of extreme heat. They are generally of a dark yellow, oblong, and conical at both ends. I have one, which when shook, rattles, some solid body unquestionably being inclosed therein. Of the several virtues ascribed to it, *Ol. Wormius* discourses more than becomes him, fancy and superstition having in my opinion the greatest share in them.

Meseurs,
p. 78.

S E C T. XII.

Stones plainly shewing their substance to be soft and fluid but suddenly indurated.
Plate 15.

I shall now in a few words mention some pieces of stone in my collection, which at first sight confirm what I have before said on the origin of rocks, namely, that the substance of marble, and of the most dense and solid stones were formerly, and probably at the time of the deluge, soft and fluid, but afterwards coagulated or subsided into their present situation, like metals after fusion. Of this I say, four pieces of stone are palpable proofs; the first has very much the appearance of a small parcel of hog's-bristles, with their thick ends inverted against each other, and with a straightness which shews the rapidity of their fluid motion, this piece is white; the second piece is a connexion of several very remarkable distinct quadrangular parts, each of the length of a larding-pin, but of the thickness of a straw, passing through each other sometimes longitudinally, sometimes transversally; it is of a dark brown, and vitreous. The third piece consists of long, fine, light-grey striæ, ten and more in a succession, and others of a like figure

gure in an opposite direction, compressed together like rays. In the fissures are some small sparks of metal. The fourth piece has coalesced into the roundishness of a cake, and is composed of many circles, gradually contracting themselves, and proceeding one from the other to the center, so that the last motion of the matter of this stone must have been circular; this stone is dark grey.

The different shapes of these lapidious substances, by casual alterations, remind me of a particular in Osterdale in the mountain of Svuku, on the borders of Sweden, which never fails to excite the admiration of the curious, and it may justly be looked upon as one of the most singular monuments of the deluge. Mr. Dantilas gives a good account of it in a memoir which he read in the year 1742, before the royal academy of sciences in Sweden, and has since been published, of which the following is an extract, "The highest crest of the mountain of Svuku in Oesterdalen, a province of Norway, lies, according to a survey taken by the barometer, above two thousand ells higher than the lake of Famund, a water betwixt the mountains. This mount consists of one solid, hard sand-stone; on the top of the mountain stands a solid huge mass of the same stone, which bears in it many marks of a dissolution and disruption, which can be attributed to nothing but water. For at the foot of this mass, yet on the summit of the mountain towards the south, are several parallel channels, three or four fingers deep, and of the like breadth, which at last meet; they appear to be the work of some miner, but upon viewing them on the summit, the most manifest indications shew themselves, as if the water had cut itself a passage along some heaps of clay, so that unquestionably the true cause of this singularity is to be sought in the impetus and agitation of the waters.

Remarkable
figure of a
stone on the
mountain of
Svuku.

C H A P. VIII.

Of the Metals and Minerals in Norway.

SECT. I. *Of the mines in general.* SECT. II. *Several gold-mines formerly opened, but discontinued.* SECT. III. *Silver-mines of more ancient times.* SECT. IV. *The present flourishing silver-works at Kongsberg.* SECT. V. *The silver-works at Jarlsberg.* SECT. VI. *Copper-works at Noraas.* SECT. VII. *The like at Meldel, or Lykken.* SECT. VIII. *Also at Einsjett, or Quikne.* SECT. IX. *At Selboe.* SECT. X. *At Fongdal.* SECT. XI. *In Aardal, and Oedal.* SECT. XII. *Of Norway-iron in general.* SECT. XIII. *Account of several iron-works.* SECT. XIV. *Some lead-mines.* SECT. XV. *Quick-silver.* SECT. XVI. *Sulphur.* SECT. XVII. *Salt.* SECT. XVIII. *Vitriol.* SECT. XIX. *Allum.* SECT. XX. *Oaker, and several other kinds of dyes.*

S E C T. I.

Of the mines
in general.

THAT the lapideous kingdom, in Norway, contains a vast treasure of metals and minerals, is not unknown, especially in this century, when the breaking, removal, and fusion of the silver, copper, iron, and lead, especially in the dioceses of Aggerhuus and Drontheim, employ many thousand hands, besides the great profits accruing from them to the proprietors, or sharers, exclusive also of the advantages to the peasants and other landmen by burning charcoal, and bringing it to the founderies belonging to those mines. That the use and advantage of the Norway subterraneous treasures, has been so greatly improved within the last hundred years, that the produce has been doubled, is unquestionable, and what further prosperity it shall please providence to grant to the minors, for their direction and continual progress in these dark subterraneous tracts, where the guidance of an all-wise hand is as sensibly requisite, as in any undertaking whatever, must be left to him, whose providence in its own time, distributes to every generation those blessings, or establishes its welfare on those things of which it stands most in need; and there is not a more striking instance than this, of the superintending wisdom, and æconomical goodness of God, throughout the whole system of nature. I know not what account to make of Paracelsus's pompous prediction of a golded age to the northern countries, affirming that betwixt the sixtieth and seventieth degree of northern latitude, time should display a store of wealth

in metals, superior to all the treasures that ever the east afforded*.

S E C T. II.

Should time verify this prediction, the generation then in being must construe it an accomplishment of the words of Job, xxxvii. 2. *from the north cometh gold*; for in the year 1697, when, although prematurely, Paracelsus's golden age was thought to be at hand, a golden mine being discovered, the abovementioned words were the impression on one side of the ducats, with the image of Christian V. on the other. The number of them however was inconsiderable, the mine soon failing, but in fineness the gold was equal to that of Hungary. And sometime before, namely in 1644, and 1645, Mr. Berensen relates, page 274, that near Aggeside, or in the diocese of Christiansand, on the estate of Mr. Christopher Gios, gold ore was found †, from which those ducats were struck, which the foreigners would by no means believe to be of Norway-gold, from a false prepossession that Norway afforded no such precious metal. However, Christian IV. to avoid the charge of an ostentatious parade, in decking himself with foreign feathers, in the year 1647, ordered other ducats to be struck of the same gold, which were called Spectacle-ducats, the reverse of them being a pair of spectacles with this legend, *Vide mira domi ‡*.

The

* I cannot specify the place in his writings, having only met with it in Scaffer's Lapland, quoted from Turnæus, and it is repeated by Mr. Peter Hogstrom, in his Description of Lapland.

† Anno 1644, Nobiliss. D. Jo. Sigfrid de Lutichau, rei metallicæ in Norv. Præfectus generalis, minera auri invenit in tractu Nedenecensi prope portum Arndalensem et curiam Barlo, nigram talcosam, frequentibus splendentem micis, in cujus bonitatem cum inquisivisset, invenit pondo centenarium ejus minere præbere auri puri marcas triginta octo, et insuper centum quadraginta sex marcas argenti.—Aliam alterius venæ massam Anno 1646, quæ ignibus depurata, ex libra una, auri puri dedit drachmas sex, præsentē Reg. M. frustum quod teneo minutioribus splendet micis et priori magis ad rubidinem vergit. Adductæ sunt ex eodem loco minere talcosæ itidem ex frequentibus granatis prægnantes, quas auro scatere multi existimant. Hanc mineram Anno 1646, Regi ipsi detexit rusticus quidam Gammel Grodewyn, i. e. old Grodewyn, dictus. Sita fodina est ad portum Marede dictum (this must be Mardoe) extractu Nidrosiensis lapis quidam arenosus aureis scatens scintillis et granulis minutis, mihi allitus et talci aurei nigrescentis squamulæ, ex quibus aurum erui volunt. In argentifodinis Norv. prope Regiomontum putens Brunswig dictus, aurum præbet, refert namque D. Normand, quod A. 1630, d. 3. April. 7, marcæ et sex uncia cum dimidia, auri unciam semis obtinuerit. Ol. Worm. in Musæo, page 115.

‡ These are, doubtless, the gold-mines meant by Olig. Jacobeus in his Musæum Regium, p. 31, Mineræ duæ auri e fodinis Norveg. quarum una intermixtam sibi

The before quoted authentic writer Mr. A. Berendsen, in the same place, says, that a large specimen of the gold ore found on the side of Agde, being sent to Copenhagen, the conclusion was, that it would barely answer the expence of working it; upon which it was discontinued. The like may be said of that small mixture of gold, which is often seen, not only in the Norway-silver, but even in the copper. The charges of separating and refining it, leaving no prospect of further advantage; and therefore the work is neglected. However, my subject being rather the nature of things than the benefits of them, I must here take the liberty to contradict a writer, in other respects of the highest merit, I mean the celebrated Aleyfius, Count Marfilli, whose works have gained him such an extensive reputation, who says, that hungary is the only country where silver is found intermixed with gold; of which our miners know the contrary*.

S E C T. III.

As to the northern silver-mines, which are unquestionably one of the greatest distinctions of this country, I must premise, that exclusive of those at present in work, namely, Kongsberg and Jarlsberg, some were found formerly, and more of late, but have not been rightly searched, or the working of them has been discon-

habet materiam, quæ quartzum metallurgis appellatur, altera pyritis speciem, quæ kies vulgo dicitur, A. 1644, rei metallicæ in Norvegiæ præfectus mineram quoque auri in tractu Nedenecensi (this must be Nedenecensi) prope portam Arndalensem invenit nigram et talcosam referente Wormio. Here I add, from good information, that some years since, persons skilled in mining, were by his majesty's order sent to Finmark to examine into the truth of a report, that the river, otherwise famous for its salmon-fishery, had a kind of gold-sand at its bottom like the Niger in Africa; but it was found to be a mistake, this supposed gold being only particles of sulphur, of a good lustre, but of no value. But about two years ago, a considerable quantity of little bits of gold were found near the district of Salten, in Nordland, among a heap of stones near Kongsfug, formerly the palace of a petty prince; this having been magnified by report, orders were given for further search, but these were also found not to be of the natural produce of that spot where they were found, nor of any other in this country, but had been left there, some ages since, by the inhabitants in those times; for they were little golden images, but made with a more than Gothic simplicity, unquestionably like the *Simulacra aurea Bornholmensia*, treated of by Jacob von Mellen, and Christopher Democritus, three such pieces are in my possession; the gold is not the best, and the figures are thin laminæ, with golden images on them, one is of about the bigness of a finger's joint, another bigger, and the third less, the first, has on the upperpart, a wheel with a ring in it.

* Hac igitur gaudet prærogativa Hungariæ regnum, quod scilicet in tot regionibus, nempe Bohemia, Saxoniis aliisque septentrionalibus locis argentum solummodo, non vero nobili societate istius metalli (de auro sermo est) locupletatur. Secus vero in Hungaria. Danub. Panon. Myfic. Tom. II. p. 107.

tinued. Of this kind are the several old mines in upper Tellemark, long over-grown with moss and grass, but which were formerly wrought in the same manner as those of Kongsberg. They are mentioned by Baron Holberg, in his present state of Denmark and Norway, and as he is of opinion that they are of very ancient date, he expresses some surprize, that not the least mention is made of them by historians, since by their remains, they appear to have been a work of vast charge and extent, perhaps not inferior to any of the silver-works in Kongsberg. This complaint of the Baron's is the more excuseable, as at the first publication of his book, the *Annales Nic. Kraggei*, which had long lain dormant, had not yet seen the light, but there he would have seen that these deserted mines were of no longer standing than the reign of Christian III. and worked at the expence of that monarch; but the Norway-peasants raising a tumult against the Saxon miners, to whose command they would not submit, as speaking a foreign tongue, for which some were capitally punished; and likewise on account of the floods which broke out from the caverns, this work was soon deserted, at a very great loss. The words of the aforesaid Nic. Kraggei, concerning this affair, in his *Vita Christ. III. in Annal. ad A. 1539, p. 204*, are as follows: "*Coeptum erat superiore anno in Tilemarchia, provincia Norvegiæ, e visceribus terræ, argenti, cupri et plumbi metalla eruere, ac probata materia, Electori Saxonie aliisque ejus rei peritis, ad quem super hoc negotium aliquoties Scriptum, magna spe arcessitæ ex Misnia operæ, mandata cura et inspectio primum stigoto Baggoni, inde Antonio Bruschio, moderatore operarum Johanne Glaffone, ac immunitates indultæ, prout in fodinis misnicis tum jura condita, quibus operæ regerentur. Nihilominus tamen illæ rusticis abutentes insolentius agebant. Eo magis dolebat miseris, quod præter solitum onera imponerentur, nullo emolumento: Simul quia res erat cum hominibus, quibuscum nullo linguæ commercio tam brevi familiaritas intercedere potuit, alienati magis animi. Itaque coierunt aliqui paroeciarum rustici, ut operantes aut affligerent, aut iis locis expellerent. Sed petulantia ipsorum a præsidibus, quos dixi, refrenata. Ac pauci quidam post, mandato regis, extremo supplicio affecti, reliquis alia multa irrogata, prout quisque culpæ affinis, aut à noxa immunis reperiebatur,*

tur, quum de sceleris autoribus est inquisitum. Verum, quum initia fodinarum laeta fuerint operæ pretium, diu tamen non admodum factum. Nam in paucis annis rex fatigatus sumptibus illi inexhaustis laboribus ceptum distruere. Causa ferebatur quod emanabat tantum aquæ à cavernis terræ, ut penetrari, quo necesse esset, sine submergendi periculo non potuerit.

Afterwards, page 282, ad an. 1545, he speaks of another tumult in opposition to the oppressive violations of the liberties of the peasants on account of the mines. It is possible that the same turbulent spirit with which at that time, under the pretence of christian liberty, the peasants in Germany were animated to take arms against their superiors, in their famous rustic war, might also have spread its infection here; though nothing certain can be advanced on this head.

Formerly, likewise, a silver-mine was worked at Heddemark, which according to the account of A. Berndsen, in the year 1630, yielded a stone of fine silver, and gave hopes of opening more grooves in that country, but nothing further has been heard of it. Likewise in Eger, and Telemark, silver-ores have been found producing eight ounces and a half of pure silver per quintal. Of other conjectures and reports of silver-ore discovered in Ryefkelt, Hardanger, Sundfiord, and other northern provinces, there is no speaking positively, till they have undergone the examination of persons versed in those matters, nothing being more common here than upon a peasant's growing suddenly rich, a whisper flies about that he has found a rich ore, and conceals it for his own private profit, though this is generally no more than the suggestion of envy. That near Solein in the manor of Lavigen, on the borders of Sundfiord, there is a river in which is found the scorix of silver-ore, I have unquestionable information from the present minister there, Mr. Thomas Sommer, in a letter of the 16th of October, 1750. There is likewise a dubious report concerning such a river in Sundmoer, in the parish of Oerfkoug. An exhausted silver-mine in the parish of Ranen in the government of Helgeland, has also long been talked of, but this was only copper-ore, and so poor, as never to requite the charge and labour. However, at the inland extremity of this district, on the borders of Sweden, is a mine containing both silver and lead-ore, and discovered by the

Swedes in the last century, but since, by order of the lord of Aluen, demolished by the Norwegians; not to mention, that from its situation it was difficult to be wrought. Likewise some copper-ore has been found with mixtures of silver, as that lately discovered at Odal, where, in the groove called Langaasen, every quintal of ore yields sixty or seventy pounds of copper, and four ounces of silver intermixed, but less in other parts.

But without dwelling any longer on these, I shall proceed to give an authentic account of the two rich silver-ore works, which are now carrying on, to the vast advantage of the sovereign and community; and these are the works of Kongsberg and Jaresberg.

S E C T. IV.

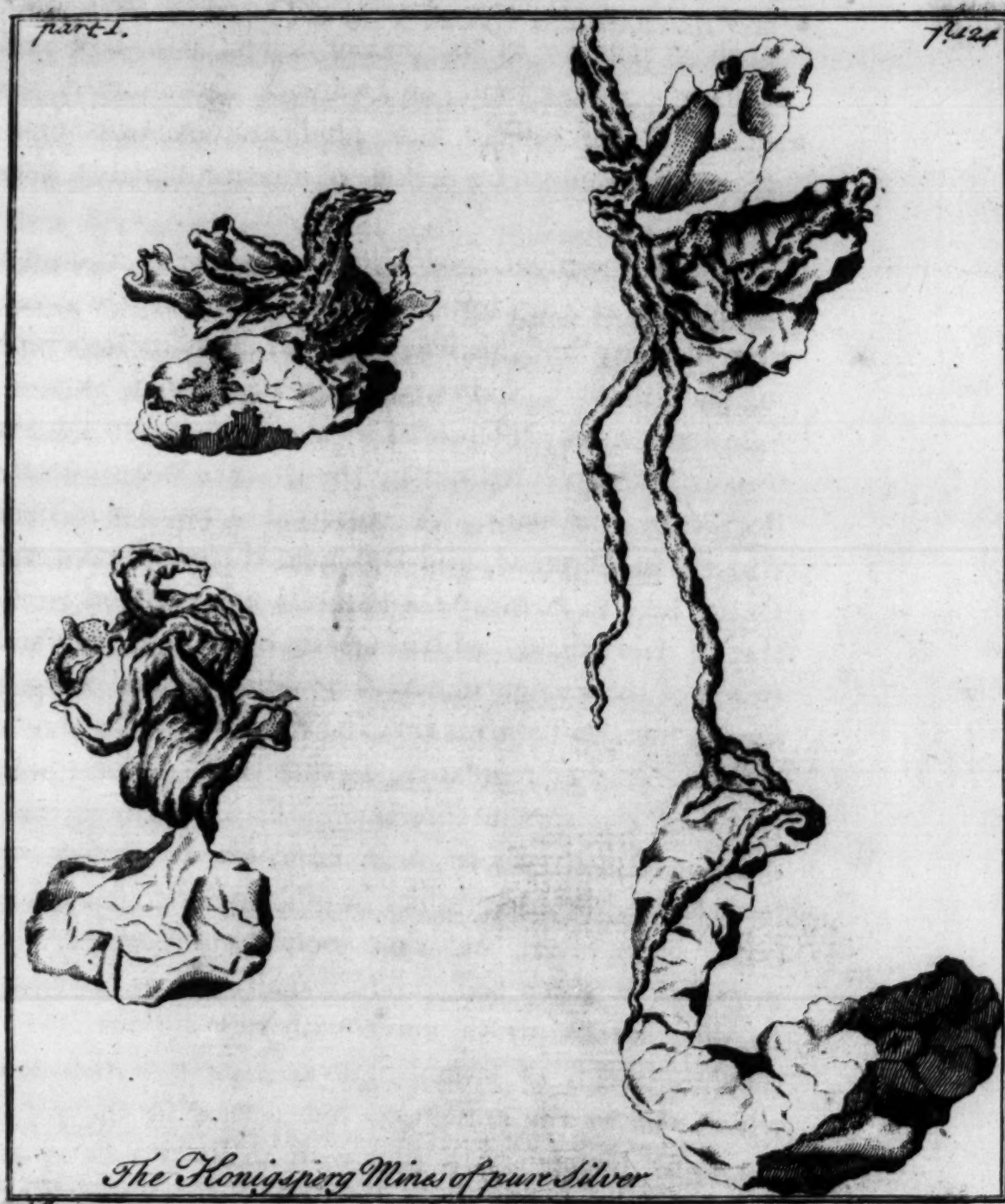
The first mine which lies near Sandsverd in Numedale, four Norway miles from Drammen, is, at present, to the best of my knowledge, the most considerable and of the greatest profit of any in Europe, and in respect of pure massy-silver veins, quite inexhaustible, whereas the German silver-ore is in a great measure invisible, and must be extracted from the lead and copper, in which it is concealed. This work began in the year 1623, and was discovered in the following manner; two peasants, by name Jacob, and Christopher Grosvaltd, attending their cattle on those steep mountains, which separate Telemark from Numedal, found the first silver-ore in some lapideous fragments fallen from the mountain, and which by way of pastime they used to throw at one another; when they heard a jingling sound! the metallic substance it yielded they imagined to be lead, and carrying it home, attempted to melt it into bullets, buttons, and the like, but their fusion not rightly succeeding, they sold their store to a goldsmith of Tonsberg, who used to sell his goods about the country. He informed the government of it, and the affair being laid before the king, orders were given for a further survey of those parts, which was attended with such success, that at a small distance from a church which then stood there, besides the rich veins of stone, a lump of pure massy silver of a pound weight was found. Hereupon Christian the fourth, was pleased to give his name to the first groove, and miners were sent for from Germany. These were the first inhabitants of the new built mine-town of Kongs-

The present
flourishing
mine at
Kongsberg.

berg, and the ancestors of the many thousands at present living there, who in process of time mixing with the Norwegians, each nation to this day performs divine service in its own language; but all are under the direction and government of the college of miners. This last however, has been subject to several changes and revolutions, the work having been carried on sometimes by a company of sharers, and sometimes, as at present, by the king alone. A more particular account of these things, as it has no necessary relation to my present design, is to be found in Baron Holberg's present state of Denmark and Norway; and instead thereof, I shall subjoin some physical remarks communicated to me, at my desire, by persons of unexceptionable knowledge and judgment.

The first method used for the discovery of the mines, was by the motion of the *virgula divinatoria*, when it was perpendicular over the ore; but this was soon laid aside, as sometimes misleading the searchers, and occasioning a fruitless labour. They then followed the way discovered by the springing of the rocks, which was naturally pointed out by the strata of the mountains, and the streaks of the veins. A remarkable particular here, is, that whereas in Germany, and Bohemia, the ore-streaks run north and south, here in Norway their direction is east and west, except in that of Gotteskog, which departs from this rule, and takes the course of the foreign mines. Though some are of a different opinion herein, and affirm, that the finest veins of ore here are without any order or regularity, so that they cannot properly be said to be of any certain direction. The Kongsberg-ore is likewise different from the foreign in largeness, formation, and solidity, for whereas the silver mines in other parts contain some, though but a little silver, and that loose and dispersed, the northern mines, as has been said, produce massy lumps or veins, or streaks. In these we frequently meet with very curious *lusus naturæ*, as they are called, of several figures; a piece of that of Kongsberg, which was in my possession, but is now in the royal museum, has some likeness to a ship with masts and sails; and another which I still have, with the help of a little imagination, represents a cock, or some such fowl. These solid lumps of silver, which are so far unknown in other parts, that foreigners will believe no such

Veins of
solid silver.
See Plate 16.





such thing without ocular proof *, being soon interrupted and dwindling to nothing, the miner must continue to dig through the barren rock, till he has the good fortune to find more, which in one day will reward the labour of a whole month, or even of some years, so that hope may be said to be the spirit of this work, through so many interstices, by which the workman must not be discouraged, but persevere in his search in a full persuasion, that ore leads to ore. Were it not for these barren interstices all the silver-works in Europe together could not come in competition with that of Kongsberg, the immense riches of which may be inferred from this, that after the discouragements of a long, fruitless labour, it suddenly exhibits several thousand pound weight of silver, and thus discharges all arrears and embarrassments, and animates to further prosecution. The labour therefore is never in vain, not even, when it most appears so, for some thousands of hands, who are employed therein, and of whom a list shall be given in the sequel, always earn their daily support. If this were all the profit, which however is very far from being the case, yet it would not be inconsiderable, for the acquisition of the silver by which so many families are maintained, and which thus circulates all over the country, must be esteemed a great emolument to the public. In proof of the large and rich masses of silver contained in the mines of Norway, I shall only observe, that in the royal museum at Copenhagen, a piece is preserved, which the whole world cannot produce an equal, its weight being five hundred and sixty pound, and its value five thousand rix dollars †. Be-

* Non in omnibus argenti fodinis hoc invenitur, adeo ut, an tale detur, dubitasse videatur Plinius alique veteres. Non occurrit in Rhetia, Norico, Dacia, sed in quibusdam Misena fodinis, licet non in omnibus, et in Norvegia in Regio monte frequentissime et in magna copia, ut ex inde massae quandoque excindantur pondere aliquot centenarum librarum, Ol. Worm. Museum, p. 115.

† Of this mass of Norway-silver, Olig. Jacobeus in his Museum Regium, page 31, gives the following description, Minera ingens argenti ex fodinis Norvegiae, pedum quinque et pollicum sex longitudinem aequat, crassitiem vero in circumferentia pedum quatuor. Anno 1666. d. 24. Augusti ex fodina Norv. Regiomontana, quae novae spei appellatur vulgo, nye Forhaabnings Grube, extracta est 560 librarum pondere, et a praefecto fodinae memoratae, pretio 5000 imperialium estimata. Huic non dissimilis massa, anno 1630, regnante in Dania divo Christiano quarto ex fodina Norvegica quae benedictio divina vulgo, Seegen Gottes appellatur, eruta est, quae 3272. Imperialium pretio estimata; to which I shall add, that in the year 1719, in the shaft called Saint Andrew, was found a piece of pure silver of two hundred and seventy nine pound, as was in the year 1727, one of two hundred and forty-five pounds, in the mine called Prince Royal, and in the same year another weighing three hundred and four pounds was found in the God's-blessing shaft, these foreign miners who have come into these parts, made a difficulty of believing it, till their own eyes convinced them of the truth.

fides the eighteen oldest grooves, the names whereof are specified by Arnd. Berndsen, more are opened from time to time, but I shall here only set down those which are worked in the present year 1751, which are the following.

List of the
shafts at pre-
sent worked.

In the first Revier.

A shaft near Aschebeck.
A shaft near old Stadsmyr.
Bratte shaft.
God's Gift, a mine.
A shaft near Justice-dale.
Poors mine.
Christian the fourth's mine.
God bless king Frederic, a mine.
God's help in distress, a mine.
Keller, a mine.
Else, a mine.
Saxony, a mine.

In the second Revier.

King Frederic the fifth's mine.
Shaft near the above mine.
Prince Royal's mine.
Brunswick mine.
Juel's mine.
Old God's blessing, a mine.
Sophia Magdalena's mine.
Prince Christian's mine.
Frederic the fourth's mine.

In the third Revier.

Samuel's mine.
Sophia Hedewig's mine.
First shaft at Samuel's mine.
The silver track.
Second shaft on Samuel's mine.
First holy Trinity mine.

Second holy Trinity mine.
 Duke Ulric's mine.
 Old duke Ulric's mine.
 Johannes, a mine.
 First Concordia mine.
 Second Concordia mine.
 Glory to God alone, a mine.
 The Salutation mine.
 The Lady Christiana mine.
 First Solomon's mine.
 Leadstreak mine.
 Gravel-mine, at Eger.

In the Fourth Revier.

Christian the Sixth's mine.
 Queen Sophia Magdalena's mine.
 A shaft near it.
 A shaft near Lucky-mine.
 Princess Louisa's mine.
 Ulrica's mine.
 A shaft near it.
 Mitlere's Winchren.
 The new God's blessing, a mine.
 N° 2. ditto. N° 4, 5, and 9, ditto.
 Ramberg shaft.
 Shaft near old Anna Sophia.

Of these mines, the best at present are the following :

God's help in distress.
 Samuel's mine.
 Old God's blessing.

These have for many years past yielded great quantities of metal, but there are among the rest many valuable mines, tho' not so constant in their breakings as these. In the fourth Revier, seven or eight years ago, the mines of Christian VI. and princess Louisa, have yielded very fine silver; but these, as of most of the mines in the fourth, the richness of their breaches has diminished

in the progress of the working, yet they are carried on with the usual diligence, in hopes of their proving better.

The deepest
mines.

It has been found that the silver-ore is not, as was at first imagined, limited to this single mountain, which lies between the river Jordal and Kongsberg; but extends its veins for some miles throughout the adjacent districts, which is proved by the new mines which are from time to time undertaken in several places, and most of them, by the blessing of Providence carried on, very prosperously. Old God's blessing, one of the most ancient and rich among all the mines, which, sometimes, within a week, has yielded some hundreds of pounds of rich ore, never fails to strike the beholder with its astonishing depth, being no less than one hundred and eighty perpendicular fathoms, and the circumference at the bottom forms a circle of some hundred fathoms. The sight of so many piles of wood burning on all sides, thirty or forty in number, in this gloomy cavern, and continually fed in order to mollify the stone, in the prosecution of the mine, seems, according to the common idea, an image of hell, and the swarms of miners bustling about in habits according to their several occupations, may well pass for so many devils, especially, when as a signal that a mine is going to be sprung in this or that course, they roar out, Berg-livet! Berg-livet! Take care of your lives! I shall here briefly repeat the words of a gentleman well skilled in mining, Mr. Eman. Suedenborg, in the preface of his book called *Regnum Subterraneum*, where he says of these Kongsberg silver-mines, which are visited by the travelling German-miners, as a lyceum in their science, to which Europe has not an equal; "Quid Norvegiæ in fodinis Kongsbergensibus, ubi jam per seculum vix nisi argentum nativum et semel iterumque etiam aurum, tanquam auræ melioris progenies, in lucem et diem gelidissimum plenissimo sæpe cornu prodierat, cujus annum proventum ab anno 1711, ad 1724. sistere volupe est, ut inde miranda naturæ phænomena in regno subterraneo existentia luculentius contemplari liceat. Ex illis fodinis ductæ sunt argenti multam partem nativi.

					Thal.	Imper.
Anno 1711,	Librae	15483	12 fem.	inpretio	172144	56
1712,	—	15490	10 fem.	3 gr.	174157	
1713,	—	12630	14 fem.	3 gr.	141246	87
1714,	—	12689	15 fem.	1 gr.	148316	45½
1715,	—	9034	10 fem.	2 gr.	108154	73
1716,	—	12744	11 fem.	3 gr.	154194	69½
1717,	—	21793	2 fem.	3 gr.	276428	65
1718,	—	19685	6 fem.	—	257149	19½
1719,	—	14824	—	—	193948	65½
1720,	—	12760	15 fem.	3 gr.	168992	42½
1721,	—	13671	10 fem.	3 gr.	178181	3½
1722,	—	16884	2 fem.	—	222285	32½
1723,	—	16722	8 fem.	3 gr.	210273	7½
1724,	—	14384	10 fem.	4 gr.	186796	5½

A comparison of these several sums shews the annual produce of these works to amount to a tun of gold and a half, and sometimes three quarters*; and the Almighty has in a signal manner been pleased, for some years past, to prosper these silver-works, since they came under the prudent management of Mr. Stuckenbruch, who by his penetrating genius, has greatly improved them by several mechanical inventions, which, likewise to the honour and advantage of the country, have invited great numbers of curious foreigners, who with admiration here behold wonders, both in nature and art, such as probably no other country can parallel.

The number of the officers of all ranks, the daily miners, labourers, and pensioners, exclusive of their children and families, who have their daily support here, according to the establishment, amount to near five thousand persons.

In the mine of Kongsberg, the following are actually in constant work :

					Men.
In the first Revier	-	-	-	-	650
In the second	-	-	-	-	600
In the third	-	-	-	-	980

* From the Vienna article in the news of June 18, 1751, it appears, that, all the silver and gold mine-works, in the Imperial hereditary States, are not equal to the single mine-works of Kongsberg, the words are these: " Since the commencement of the reign of the empress queen, or from the year 1741 to 1751, 1,398,364 guilders have been coined at her Imperial majesty's mints of gold and silver, produced by the mines in the Austrian hereditary dominions.

In

	Men.
In the fourth	900
Sawyers	60
In the founderies	40
In the mint	16
Carpenters	80
In the spring foreign peasants are taken into work for wood and coal; and in winter, when day-labour ceases, an hundred men are employed in mining, besides sixteen men kept in constant pay for repairing the flat-boats, and the like, amounting to	116
In the summer, the day-labour commences in June, and continues till the close of November, when the men employed are at least	200
Disabled and sick, receiving pensions from the mine-chest	300
Miners widows, likewise pensioners	500
Officers widows	30
Officers on pension	20
Officers actually in service	50
Issuers	40
Total	4582

The number of all the inhabitants of the town of Kongsborg, amounts to betwixt ten and eleven thousand souls.

The principal officers are the following:

The governor of the mine.

The comptroller of the mine.

Three assistants.

A secretary.

A superintendant.

A clerk of the mine.

An officer to fix the boundaries.

Four jurats.

Four head-refiners.

Two purveyors.

A clerk of the huts.

A master of the huts.

An assay-master.

A master of the mint.

An engraver.

A keeper of the saws.

A chief forester.

Three under foresters.

A forest-clerk.

A physician and surgeon.

S E C T. V.

The other Norway silver-mine was discovered in the year 1726, and begun by the families of Hufmann and Cicignon, and afterwards, in the year 1734, devolved to count Wedel. It lies near Bragnas, and for wood, water, and other necessaries, is very conveniently situated; and its ore likewise is very rich, but without such solid veins or masses of pure silver as those at Kongsberg, the ore, like that of the German-mines, having a large mixture of lead and copper, which, in the phrase of the miners, must be *made good*, and separated by fusion. This operation has hitherto been inexpressibly difficult and laborious, and the prosecution of the work has been greatly obstructed by the tedious labour, and excessive charges occasioned by the hardness of the metal, or rather by the adhesion of the metal, and its intimate conjunction with the stone. Whether this arises from a large mixture of arsenic and antimony, or from what other cause, has been a controverted point, and I must refer the decision to better judges. The hand-stones which I have of this, contain, as I have said, copper, iron, and lead, intermixed with the silver, yet the silver in such abundance, that when experience shall have improved the present method of fusion and separation, and this mine comes to be wrought with more skill and attention, I am of opinion it will prove no less profitable than that of Kongsberg itself. In the mean time the silver and lead found here, is sold to the royal mint at Kongsberg at a settled rate. The names of the mines hitherto found, and now wrought at the depth of forty-five fathoms, are upwards of twelve in number. In copper-mines this kingdom has likewise been providentially and remarkably distinguished, especially in the

The Jarlsberg
silver-works.

mountain Nordenfield, which most abounds in this metal, as Sondenfield doth in silver and iron. The excellency of our copper hath recommended it so much among foreign nations, that many shiploads of it are annually exported, tho' for the most part unwrought, which is contrary to the maxim of our neighbours the Swedes.

S E C T. VI.

The copper-works at Roraas.

The first, and hitherto the richest copper-work in Norway, and since that of Falun in Sweden, is said to be near exhausted; possibly the richest in all Europe, is that of Roraas; twenty miles N. E. of Drontheim, and discovered in 1644, by Laurence Lofsius, refiner at the mine of Quickne, and who at the expence of his father-in-law M. Andrew Olfens, superintendant of Dalerne, and in concurrence with him opened, and forwarded this great undertaking. There are some other particulars relating to this work recited in a printed sermon of Mr. Peter Abildgaard, on occasion of a jubilee celebrated on the 9th of October 1744, by the inhabitants of Roraas, which is now a considerable mine-town, in gratitude for the uninterrupted prosperity of their mine during the course of a hundred years; and it is remarkable, that in this jubilee year, a new shaft of excellent slate was discovered not far from the old mine of Storvart, which is one of the oldest and best courses. These courses of the copper-veins, agree in their direction with those of other parts, neither ascending nor declining, but like other strata, traversing the mountains horizontally, tho' thinnest towards their centre, like a lump of dough, which pressed betwixt two stones, is thinnest where the pressure lays greatest. From the nature and disposition of the parts, Mr. Daniel Tilas, in his discourse before the Swedish Royal Academy of Sciences 1742, borrows a very ingenious argument, and shews from some other correspondent instances, what I presume has been already evinced by me, to some degree of probability, in the second chapter. He likewise applies those instances to Dr. Woodward's hypothesis on the alterations of the terraqueous globe by the deluge. And this entertaining little piece not coming into my hands till after I had discussed that subject, to which it properly belongs, I shall here insert that part of it which speaks of the copper-mines now under

consideration. The passage in a free translation runs as follows :
“ A more than convincing proof that the mountains once were soft and fluid, is the horizontal and expanded direction of the copper-veins near Roraas in Norway, especially those in Hestefield, likewise the mines Christianus V. Myr, and Hesteklet. This mountain is of a vast breadth, and rises with a very steep acclivity, with several protuberances on it. On the south end, several courses of ore spread themselves east and west, the eastern being carried on by the mine king Christianus V. and the western by that of Hesteklet; and these two mines, in length of time, would certainly meet, so as to open a passage quite through the mountain, had it not lately been observed of the ore-courses, that the greater the height of the mountain is over them, the more they are compressed. They are already so near to each other, that the workmen in one can hear the strokes of those in the other. But the mine Christianus V. being advanced to the highest part of the mountain, the ore-course is already too narrow to be worked, and that of Hestekler is also gradually approaching to the like contraction; a circumstance which has heretofore shewn itself on all the mines, that, on coming under an eminence, the ore-course beneath has been compressed, &c. Besides, the body of the mountain itself, under these eminences, shews itself to be much more compressed, and, vice versa. I see no other cause to which this can be imputed, than to the primordial fluidity of this substance, and the subsequent compression increasing from the weight of the superjacent strata.” So far Mr. Tilas, wherein he seems to predict to posterity a want of ore in these parts; but they who are thoroughly acquainted with the affair, are of opinion that the country near Roraas contains a store for many generations, and that a want of fuel is more to be apprehended, the neighbouring woods being already consumed, which occasions the coal to be brought from some distance; and consequently raises their price. This should incite those, of whom it is the more immediate concern, to promote the growth of young woods, and to restrain the keeping of goats, which do so much damage among the saplings; for how many thousand last of coal, beside stacks of wood, this copper-work requires, may in some measure be conceived only from this circumstance, that only the calcination
of

of the ore requires a fresh fire, six, seven or eight times. That there are in this place, which not very long since was a wild desert, great numbers who now earn a comfortable subsistence, is observed by M. Peter Abildgaard, in his before-mentioned Jubilee sermon, where he says, "It is not much above a hundred years since the only inhabitants of these parts consisted of seven or eight families, making about thirty or forty persons, and these led a savage life, and derived all their support from hunting; whereas, now, the number of this congregation exceeds two thousand, exclusive of the neighbouring, which contain many more; and all subsist by the working of the mine."

To the Roraas copper-work belong several founderies, which for the conveniency of a ready supply of wood are built at a distance from each other, and in places, to which in winter, when the morasses and rivers are frozen, the ore may be conveniently carried. Particularly at one place called Tolgen, four miles from Roraas, are three founderies, and of the copper for some years melted in them, I shall here set down an account taken from Mr. Schwedenborg.

Regnum sub-
terraneum,
p. 124.

Year.	Ship pounds of pure copper.	
1698	-	700
1700	-	1140
1702	-	975
1704	-	1510
1706	-	1467
1708	-	1460
1712	-	1353
1718	-	933
1722	-	1087
1723	-	1102
1724	-	1128

These founderies annually consume betwixt 12 and 15000 lasts of coals, and 5 or 600 fathoms of wood.

S E C T. VII.

The medal,
or Lykken
copper-work.

Next to Roraas is the medal or lykken copper-work, four Norway miles and a half from Drontheim. It is said to have been discovered in 1654. Its founderies lie near Svarkmæ, and Grudfetter,

fetter, and according to the same writer the produce of them has been as follows;

Year.	Svarkmæ.		Grudfetter.	
	Ship-pounds of pure copper.		Ship-pounds of pure copper.	
1720	-	722	-	120
1721	-	694	-	261
1722	-	566	-	263
1723	-	478	-	210
1724	-	401	-	215

S E C T. VIII.

The Indset or Quickne copper-work lies ten Norway miles from Drontheim, and though discovered in 1635, was not wrought to any great effect till 1707. Its ore is of easier fusion than the former, and has less stone in it, but on that account is the more saturated with sulphureous particles. A quintal of the ore yields 12 ship-pounds of copper, which require a 100 lasts of coal, and its annual produce is betwixt 3 and 400 ship-pounds of metal. The former director, M. Brostrup Fax, found out a method here, by precipitation, to transmute iron into copper; the process of which is thus: Near the caverns lie heaps of marcasites and scorixæ, through which water is made to run into little channels filled with bits of iron laid lengthways one below the other. This vitriolic-water carries with it the copper sediment, and sometimes copper itself, and permeates through the iron till at length it becomes copper. I have a specimen of this transmutation, though so far imperfect, that the internal part is still iron, and the surface on all sides copper. Half a year is the term of a complete transmutation; but it must be carefully attended, particularly with respect to the time, for if it should lie a few days beyond the regular period, it would be spoilt by the dross and metal intermixing. The iron suffers a diminution in its weight, but this is compensated in the profits of the transmutation. I remember Count Marfilli, in his before-cited work, mentions a practice of this nature at one of the copper-works in Hungary, where the vitriolic-water, running from channel to channel, produces a like effect, and has illustrated his account of it with a copper-plate.

E e e

S E C T.

S E C T. IX.

The Selboe
copper-mine.

The Selboe copper-work lies six Norway miles eastward from Drontheim, and was discovered in the year 1712. The ore at first had a greater mixture of stone and sulphur than at present, for it is now arrived to greater purity. It is carried, the distance of three Norway miles, to Mollenaar, where three foundries are erected. Seven ship-pounds and a half of pure copper are extracted from a hundred tun of ore. Which, of the before-mentioned copper-works, the curious M. de la Martiniere took a view of, I know not, and much less with what truth he could mention a silver-mine within two Norway miles of it; this indeed, throws a suspicion upon his whole narrative. However, I shall here insert it from Happel's translation in *Mundo mirabili*.

Tom. III.
L. XIX. c. 2.

“ Upon our arrival at Drontheim, we waited on the superintendent-general of the mines, to deliver him our letters, and desired that our corn might be unloaded with all convenient dispatch; but his answer was, that all his inferior officers being at the mines he must send a messenger thither, before our business could be transacted. Upon this I desired our captain's leave to go along with the messenger, which being readily granted, we set out early the next morning on horseback, and came to Steckby, a large town six Norway miles from Drontheim, where we thought it advisable to spend that night, which was coming on so early as about three o'clock, for we were to pass through a large wood, infested by wolves, bears, and linxes, which being very ravenous, made it more dangerous to travel in the dark. We were mounted by break of day to continue our journey to the mine, and about dusk reached the foundries, where, according to the custom of the country, we were liberally entertained with great plenty of beer, brandy, and tobacco. It was my good fortune here to meet with an officer, who having attended a Norway nobleman in his travels, spoke very good French. I told him, that a curiosity of seeing the mines had brought me thither, and that I should take it very kindly, if he would be pleased to assist me in it, which he promised I might depend on the very next day, and after cementing our acquaintance with a hearty carousal, we betook ourselves to bed. The messenger who left

me and returned to Drontheim, having recommended me to one of the mine officers, who the next day proposed to carry me with him to the mine. My first business the next morning was to go to my new acquaintance, who had prepared a good breakfast both for himself and me, and the officer, my guide, whom, during our repast, he desired to shew me the several parts of the works. Accordingly we left the foundery, which stands upon a high mountain near the entrance of the mine-works, and on the top of which is a crane, worked by two men, each in a wheel. These draw up from the mine large masses, sometimes of ore, sometimes of earth, as the free-stone, and potter's clay is drawn up at Paris. The officer and I having seated ourselves in a wooden vessel, compacted with iron and cords, were let down into the shaft, to the depth of fifty fathoms. Upon reaching the bottom, I could not forbear imagining myself in a kind of hell, nothing appearing but dismal dark caverns, large fires, and the workmen looking like devils, all in black leathern coats, and leathern caps like those our clergy wear in winter, sloping towards the lower part, and widening upwards to fasten over the nose to keep out the smোক, with aprons of the same. The work in these mines is various, some breaking the ore, others busy with their instruments in seeking for copper-veins or water-courses, which sometimes suddenly break out, as not long since was the case, and with so much violence, that without the greatest activity in stopping it, the whole mine had been under water. The officer who had accompanied me in this descent, observing me to be seized with shivering, rung a bell as a signal to draw us up again, which was done in as short time as we had been let down. We then returned to the foundery, where my generous interpreter had provided a good dinner ready for us, and after a cheerful meal, he, the officer, and myself, set out on horseback to take a view of the silver-mine works, at two miles distance from thence. Upon our arrival there, we went up to the chief overseer's house, who very jovially bid us welcome in a glass of brandy, which he afterwards filled round, and this was succeeded by tobacco and beer in plenty. After this regale he conducted us to the foundery, which was about a quarter of a mile from his house, and nearly of the same construction as a copper-foundery. Here the workmen were all busy in various employ-

employments, some separating, some washing, some melting, some refining, and some forging; all for the king's use. From the founderies we went to the mine works, which were in an opposite mountain, the officer and I went down; but I found no manner of difference betwixt this and the former, the shaft, fire, and garb, the method and time of working were entirely the same; as to the latter, it was three hours before noon, and three hours after, but in summer four. In their leisure they are full of mirth, dancing to a lyre of their mode, and other instruments, I had the pleasure at the copper-foundery to be a spectator of one of their revels. In the winter all work stands still, but they receive their daily pay of five Danish shillings as in summer when at work."

The importance of this copper-work may in some measure be conceived from hence, that besides the many millions which for these hundred years past have accrued from them to private persons, the tenths alone being an annual revenue to the crown of thirty or forty thousand rixdollars, and on the last Swedish invasion, a draught of five thousand effective men was made out of the workmen in these mines.

S E C T. X.

Fandal
copper-work.

Last year a copper-work was opened at Fandal in Gulbrandsdale below Dofrefield, and which the proprietors have a prospect of turning to very good account, but as I have no particular information of it, I shall pass it over with saying, that the name of the main groove is Frederic's gift.

S E C T. XI.

The copper-
work of
Aardale.

The copper-mine of Aardale, in the district of Sundfiord, in the diocese of Bergen, being discovered at the beginning of this century, has been wrought first by private persons, and afterwards on the king's account, the ore being esteemed very fine and good, and not without some mixture of gold; which induced king Frederic the fourth, to purchase the mine for thirty thousand rixdollars; but afterwards, by the variation of the ore and other accidents, it has been for a long time suspended; however, pursuant to a proposal laid before the revenue-chamber, it is soon to be set on foot again.

About thirty years ago a society undertook the working of a copper-mine found on the island of Smolen, not far from the lesser Fosen, now called Christiansand, but dissensions, and other causes have put a stop to it. On the island of Smolen.

On the other hand, in the year 1741, a society undertook a copper-mine at Oedal, nine Norway-miles from Christiania, which turns out to their great advantage, every quintal of ore yielding, besides some silver, sixty or seventy pound of copper. Oedal.

S E C T. XII.

Iron, which Pliny justly calls, optimum vitæ pessimumque instrumentum, abounds all over Norway, but chiefly in the diocese of Christiansand, where the spiritus vegetativus, seems to have impregnated *, all kinds of earth, according to the frequent observations made from chymical analyses of water, stone, and moorish earth. Dr. Nichols, in a letter of his, says, that, among all the several substances of which our earth is composed, none is more generally found than iron, this metal being resident not only in all kind of stones, but also in loam. This he proves by the colours of loam, and the iron marcasite, by the facility of vitrifying loam, and by the similitude between vitrified loam, and the iron lamellæ, by the dark red colour, which loam acquires by calcination, and lastly, by this, that when burnt with a mixture of Of iron in general.

* Concerning the vegetation of all metals by means of a vitriolic spirit, which, according to the Creator's disposition, emanates in vapours from the center of the earth to its utmost extremities, and particularly resides in the mountains for the gradual growth of new metals, a great deal has been written by those who believe such a vegetation, though, by what I can see, experience is not on their side; no miner saying, that he has ever observed any appearance of new metal to have grown in mines after being exhausted an hundred years or more: But a more decisive confutation of it is, what I have mentioned concerning the ore-drifts, the copper-mines at Roraas, in the same large flat strata, as at the creation, or at the deluge. However, as matter of further reflection for those who may be of another opinion, I shall here add, what the very eminent Count Marfilli writes on this subject, the rather, as from the price of it, his work is not in every body's hands, in Danub. Panon. Tom. III. p. 117. he says, "Metalli hujus (ferri) ex primo illo, juxta nostram hypothesein reliquis etiam nobilioribus metallis communi principio, seu spiritu metallico deducendo videtur, sub vario tamen respectu seu gradu maturitatis, juxta majorem minoremve matricum ac succorum ibi occurrentium aptitudinem. And further, p. 129. Attentis observationibus, quas hætenus recensuimus, visum nobis est, posse probabiliter statui, communem quendam halitum metallicum seu spiritum ex penitioribus terræ (veluti semen ibi lege conditoris reconditum) ad superficiem usque elevari, tamque montium partes pervadere, quam ipsas planities, verum tamen congruam ipsius fixationem potius in montibus fieri, ratione peculiaris structuræ lapideæ ac secretionis succorum ibi concurrentium ad differentiam structuræ ac porositatis terræ componentis planities. Philosophical transactions, Vol. xxxv. N. 402.

PART I.

F f f

oil,

oil, it becomes pure iron. It is certain, however, that iron is not universally of equal goodness, or equally malleable, and on account of its extreme hardness requires an immense quantity of wood, and tho' not inferior in real value cannot be attended at so low a price as in Sweden: the lower class of people there are under a necessity of working for small wages, and a poor peasant, often undertakes a little foundry of his own, being sure of a quick vent; whereas in Norway, all the iron-ore in general is wrought at a great expence, and the several branches of it require a very opulent proprietor, or even a society of proprietors. Out of the moor-iron, which is found in large lumps among the morasses, the peasant himself makes his domestic tools and utensils *. However next to the timber, iron is one of the most profitable products of Norway, several hundred thousand quintals being annually exported, partly, and chiefly in bars, partly in cast iron, as stoves, cannon, pots, kettles, and the like; the national profit of which is estimated at three or four hundred thousand rixdollars: These iron works are the following.

S E C T. XIII.

List of the
iron-works.

Bareboe, likewise called Baafelands-works, lies two Norway-miles from Arendal; this is one of the oldest, and still in a good condition.

In Regn.
subter.
p. 169.

Barums-work, like the former, and close to it. Its ore is by Mr. Swedenborg accounted the best in Norway.

Bolvig's-work, not far from skeen.

Dikkemarks-work near that of Barum, is at present discontinued.

Edsvolds-work in Over-rommerige, its founderies and machines are to be seen in the above-mentioned place, of Mr. Swedenborg's work, page 165.

Egelands-work in the parish of Gierstadt, is but a little undertaking.

Eidsfos-work in the county of Jarlsberg.

Fossam-work near skeen, is one of the best, and famous for the great number of cannon cast there.

* In the parish of Vinia in Waas, is a kind of moor-iron, as hard as steel, of which the peasants make excellent axes, scythes, knives, and the like.

Hakkedals-work in Hadeland, four Norway miles from Christiania.

Kongsberg-work has for some time been intermitted on account of saving the coals for the silver-mines.

Laurwigens-work belonging to the county of that name, is the largest and of the greatest produce throughout the whole country.

Lessa in Gulbrandsdale below Dofrefield, was opened a second time in 1710, Mr. Swedenborg describes it in pag. 168.

Mosse-work near the town of Moss.

Nefs-work not far from Laurvigen, and belonging to the same proprietor.

Oudals-work in the district of Solfer; the ore of this is poor.

Vald near Kragerø.

Ulefos, likewise called Haldens-work, one Norway-mile and a half from Skeen. A particular circumstance of this work is, that the iron-mines run under a lake, so that for a quarter of a mile, the roof of the mines has a deep water over it, the motion of which may be plainly heard within the mine.

It remains to be observed, that iron was the first metal wrought in this country, and many hundred years before the working of the more precious metals was thought of, and by all accounts the oldest works are those of Eilefield near Saint Thomas's church, and in Lessa and Edswold; but the moor-iron was certainly the first discovered. Ol. Wormius says, " Tacitus refert, Gotthones coluisse ferri fodinas. Agricola eas celebrat, quæ inter segnedaliam et osterdaliam sunt, ut et in Telemarchia ad tertium à seida oppido lapidem eruuntur.

S E C T. XIV.

By all the intelligence I have been able to acquire, tin has not yet been found in this country, but in the county of Jarlsberg, lead is found mixed with the silver-ore, as I have before mentioned; this lead is said to have a hardness in it, which renders it not so fit for use in the Kongsberg founderies as could be wished; and therefore it is generally disposed of to the English. The old grooves near Christiania or Aggerhuus-castle, are said to have been worked in search of lead and copper, and not for silver-ore, as Agricola pretends.

De Metall.
lib. ii. cap. 8.

Cragii Annal.
p. 204.

But Mr. Artid. Berndsen, in his book on the fruitfulness of Denmark, and Norway, page 276, relates, "that in the year 1630, copper and lead-ore were found intermixed at Tellemark; and according to Nicholas Cragius, a hundred years before, and in the same country, a like discovery was made. I have been informed by credible persons, that near Fossand-house, in the parish of Strand, besides the iron-ore, several rich veins of lead have been found. I lately had a specimen of lead-ore sent me, which, upon fusion, proved very rich and good. It came from Ryefylke, not far from Stavanger. If the vein, upon farther search, should be found large and answerable, it will be found very well worth working. The lead-ore, mixed with silver, belonging to the district of Helgeland, on the borders of Sweden, has already been mentioned.

Eger, not far from Kongberg, also affords lead-ore, and of the Jarlsberg kind; and the proprietors of the copper-work of Oudal, in the district of Soloer, have lately begun to open some lead-mines.

S E C T. XV.

Quicksilver.

Of the other minerals, which are commonly denied the appellation of metals, and of several kinds of fossils, used for dying and painting, some intelligent persons inform me that there are some to be found here and there in Norway, but others not at all. Great searches have been made after quicksilver, or mercury, but hitherto without success, except at one place, where it is matter of great doubt whether it was originally produced there. A few years ago, counsellor Stockfleth, found in a clod of earth near the house of Viul, as much quicksilver as would have filled a basin; but, as after a great deal of laborious digging and searching no more could be found, it occurred to some, that this mineral was not native there, it being possible that the quicksilver of several looking-glasses, destroyed in a fire some time since, and thrown thereabouts, might have run together and coalesced in this lump of earth. The conjecture of Th. Bartholin, is still more uncertain on the Gramen Ossifragum, found in this country, which he supposes to be an indication of lead or quicksilver being contained in the earth where it grows.

In Actis Med.
et Philos.
Hafniens. ad
A. 1673, vol.
ii. p. 127.

S E C T. XVI.

Sulphur is likewise to be found among our mines in great ^{Sulphur.} plenty, but it is not thought worth melting and depurating, as is done at Dylta in Sweden, the Iceland Vulcano's ejecting whole torrents of sulphur *, which the company's ships carry to Copenhagen, in sufficient quantities to serve all the powder-mills; which is the chief demand for it.

S E C T. XVII.

Norway affords no visible salt-mines; but near Fredericstادت is ^{Salt.} a saline spring, tho' for several reasons it is neglected. Whether this spring arises from the sea or from any subterraneous mine is not clear, though from its distance of a Norway-mile from the sea, it can hardly be supposed to derive from thence. I have already spoke of the salt, which in several places is boiled out of sea- ^{Chap. iii.} water, yet shall here add the following short account of the royal salt-work near Tonsberg, to be found in Mr. Müller's description ^{Page 109.} of Tonsberg, lately published.

In the year 1739, his majesty was pleased to order salt-works ^{Of the salt-works near Tonsberg.} to be erected in the peninsula of Valoe, a Norway-mile and a half from Tonsberg, which in the year 1742, was compleated under the direction of Mr. Van Beuft of the privy-council. It has two refining-houses, each two thousand feet in length, and divided into six reservoirs, to which the water is conveyed out of the sea by a wheel worked by horses, and running in channels

* Among all the mountains of Norway no volcanoes have hitherto, God be praised, been known, though, from the following circumstances, some such dreadful phenomena may in the course of time break out. In Hardanger, near Diodne-house, in the parish of Kinzerwüg, is a mountain about two hundred fathoms in height, the summit of which, as old people affirm, a little above a hundred years ago began to split and separate, though then the clift was so narrow that an active man could leap across it, but in time it gradually enlarged to nine or ten ells; upon which the owner of the houses, according to the devotion of this country, made a vow of a yearly offering to Kinzerwüg-church, since which the apperture is said to have continued as it was; but on the other hand, that part of the mountain which lies toward the south, has sunk perpendicularly, and is gradually sinking; this side, as I myself have seen, is six or eight ells lower than the other: whether this be not a symptom of a subterraneous fire, I will not take upon me positively to pronounce. The Turin article, in the public papers of August 21, 1751, informs us, that the mountain Plainjou, near Passi in Savoy, had lately burst in the like manner, with a very copious evaporation of sulphur, which diffused its smell all over the country, and occasioned the people to expect fiery eruptions, like those of mount Vesuvius.

through wears from one reservoir into another, till it has attained its proper pungency. The salt-pans, or the large kettles in which the water is boiled, yields in two or three days two and twenty tuns of salt, large measure, the tun being computed at twelve bushels, and each pan requires every time four or five fathoms of wood. But in spring, or the beginning of the summer, where, by the melting of the snows, the rivers carry a greater quantity of fresh-water into the sea, which somewhat diminishes its saltness, the boiling requires longer time, and consequently more wood. Mr. Müller accounts this salt better than that of Lunenburg, tho' some, possibly from conceit or partiality, assert the contrary. This salt-work has a separate jurisdiction, from which, however, an appeal lies to the minery-court at Kongsberg.

It was imagined that arsenic had been found in the silver-mines of Jarlsberg, and to this, among other things, the hardness of the ore was attributed, but persons better versed in these matters, deny any such thing.

S E C T. XVIII.

Vitriol.

Vitriol, the inseparable concomitant of copper and iron, might be had here in great plenty if the preparation of it could be brought to turn to good account. The Norway-company, some years ago, begun to establish, near Kongsberg, a vitriol-work, which they called the Loft-Sons; but that, antecedently to this, there had been vitriol-works in Norway, appears from the following words of Ol. Wormius: "In Norvegia simile vitriolum elaboratur arte, magis ad cæruleum quam ad viridem tendens colorem, verum non in massis, sed in granulis asperis et inæqualibus prostat. Viribus et facultatibus nulli cedit." The English prepare their vitriol from a kind of yellow-veined pyrites, which, after being exposed three months to the open air, becomes fit for yielding vitriol. It is hardly a question, whether the like might not also be done here?

In Mus. cap.
x. p. 25.

S E C T. XIX.

Allum.

Allum, which has so near an affinity with the former, and contains it, is found in great plenty under Egeberg, near Christiania, betwixt the slate-flakes, and works have also been set up there, which yield plenty of vitriol as well as Allum; but the latter is not

not easily separated from its sediment, so as to be brought to a proper transparency, and on this account is so much the cheaper*. However, this sediment makes a fine brown dye, like the well-known English oker, and some spots of this kind are found in Morasses; this, when carefully taken up, so as to be clear of sand, is found fit for painters. I myself accidentally alighted upon such a kind of brown oker in the parish of Sund in these parts; and the island of Carmen is also said to produce the like; but in the parish of Quælfjorden in Nordland, it is sold at a rix-dollar the tun, and used for painting houses. Ol. Wormius, in his Mus. cap. III. p. 4. makes some mention of two kinds of red earth in Ferro, which are of use in painting.

A brown dye
made of it.

S E C T. XX.

Cinnabar, or Minium-nativum, by all that I can learn, has not yet been found here, but several places produce very good ockra, or oker, which belongs to the iron species, or is a kind of iron-rust. The samples in my possession are of Sulen on Sundmoer, Qualøe in Ryefylke, and from Gedderen. Out of the gates of Christiania, near the place of execution, a vein of very good oker runs along the side of the declivity of the mountain.

S E C T. XXI.

It may be presumed from the copper-mines, that by a diligent search, rightly directed, a blue colour, like the ultramarine, or some such, might be found, but the country near Wardehuus in Finland, on the borders of Russia, produces a fossil of a fine sky-colour, of which a gentleman lately brought a specimen, by which it appears very well to deserve a further inspection, the connoisseurs being unanimous in their high estimation of it.

A blue co-
lour.

Near the before-mentioned house of Viul in Ringerige, is found a very black shining fine loam, and so fine that it follows the pencil with the smoothness of soap, and may be stiled the Norway Indian-ink †. Near Stavenger, as also at a greater distance from

A black co-
lour.

* In some places urine is made use of for precipitating the sediment, which hinders the allum from attaining its genuine clearness: whether this process has been introduced here I know not.

† I have been lately informed by Mr. Gabr. Heibeg, superintendant at Nordfiord, and pastor at Gloppen, that near the houses of Ryg and Eide, if not in other places, a kind

from the town, is dug a kind of black colour, which, in appearance, nearly resembles dried coals, and by some has been introduced for painting.

A fragrant
white loam.

Near Aalgaard in the parish of Giesdal, in the above-mentioned province, in the bottom of a little fresh spring, is found a kind of white loam, like *Terra-sigillata*, and also very ductile; but the most remarkable property is, its agreeable smell like that of musk.

Terra anti-
corbutica.

In the *Epistolæ Ol. Wormii*, particularly in the second part 717, in a letter to T. Bartholin, mention is made of a kind of mineral-earth beneficial against the scurvy, and found near Bergen; but the particular place is not specified, and all of whom I have enquired know nothing of it; which shews the utility of placing in a permanent and conspicuous light what minute discoveries are gradually made in any part of natural philosophy. The words of this learned person, in that place, are these: "*Terra illa anti-scorbutica, cujus mentionem facit catalogus, prope Bergas in Norvegia reperitur; eam mihi attulit Fabricius Medicus Regius, qui ait, ejus civitatis—Poliatrum, non sine successu ad fudores in scorbuto movendos ea uti, drachma una in aqua appropriata: cum effoditur, impura valde est, radiculis et sabulo repleta: munda lentorem et pinguedinem nullam habet, sed formam pulveris refert, colore Turpethi-mineralis, ex mercurio confecti.*"

a kind of black earth is found, of which the peasants make a very good dye for their stuffs, which shews that it is likewise proper for painting, and might be used instead of lamp-black.

End of the FIRST PART.

